Systems Thinking
A strategy for reform in medical education
Michael McShane, MS II

Medicine is currently undergoing a time of transformation. Over 10 years have passed since the Institute of Medicine’s “To Err is Human” report challenged health care providers with the task of providing safe and effective care to patients. There are many obstacles to successfully carrying out this task including the widespread shortage of health care providers, an increasingly complex science base and the development of information technology. These events require current and future health care providers to acquire a new set of knowledge, skills and attitudes to allow them to be able to successfully navigate through this new workplace environment. This dynamic shift has highlighted the gap in education that exists between traditional medical education curricula and the many elements necessary for the assimilation of future health professionals in today’s environment. Many students graduate from medical school without a clear understanding of how to deal with the challenges of their ever-changing work environment and lacking the skills needed to improve it.

Medical educators have been tasked to confront this curricular gap, specifically in the education of future healthcare workforce. As a first step, they must evaluate traditional medical education in an attempt to add elements that will better prepare students. However, at the same time, they must provide students with the fundamental background essential to achieving competency in the scientific underpinnings of medicine. To help guide educators in targeting certain content areas, many organizations, including the Institute of Medicine, have published reports in recent years. Despite these publications, educators still must create a detailed road map to improvement to reach the ultimate goal of implementation.

A solution to the problem of constructing a road map may be found within the content suggested in recent curricular changes: systems thinking, a major concept within quality improvement. Systems thinking is a principle developed from the founder of the science of improvement, Edward Deming, who describes four major parts that a manager needs in order to effectively improve a system. His four elements allow the manager of the system to appreciate the elements of a system and, more importantly, the interactions between them that result in variability. Ultimately, systems thinking allows the manager of a system to better predict the outcome of a system improvement.

Although systems thinking is new to medicine, its use in other complex industries is not uncommon. Toyota, considered one of the most successful car companies in the world today, adopted many of Deming’s principles after World War II in an attempt to improve the quality of their product. Focusing on continuous improvement and respect for people, Toyota sought to make a high quality product in an efficient manner. Studying their system, the subsystems that compose the system, and the interaction between those subsystems, Toyota successfully reduced variability within their product to create a standardized high quality project. At the same time, Toyota targeted specific areas within the manufacturing production in order to increase the efficiency of the process. Toyota’s successes led to the adoption of similar systems thinking principles in automotive industries.

“Many students graduate from medical school without a clear understanding of how to deal with the challenges of their ever-changing work environment and lacking the skills needed to improve it.”
other industries. Airline companies, for instance, by studying the system, have targeted critical interactions between pilots and technology that have resulted in safety weaknesses. Following the implementation of pre-flight checklists and crew resource management programs, the airline industry has reduced variability in the safety of flights and has reduced accidents by a great degree.

“Success of quality improvement projects has suggested that applying systems thinking to medicine is a practical approach to improve the healthcare system.”

Medicine has now adopted a similar approach in the past decade, recognizing that the quality of care may be lacking in certain areas. Success of quality improvement projects has suggested that applying systems thinking to medicine is a practical approach to improve the healthcare system. Following this trend, it is possible that medical educators will have similar success in medical education.

Medical education is complex. Educators must provide for a continuous stream of new students that are engaged in a nebulous educational experience. Educators interact with students in this educational experience, yet each interaction is difficult to define and is in a state of flux. Added to the complexity is the overarching medical system, influencing both educator and student attitudes about the educational experience. Somehow educators are tasked with organizing these interactions within the educational experience in an attempt to standardize the individual student’s experience. Perhaps systems thinking can help us better understand the subsystems that make up the medical education system. By breaking down the system into manageable subsystems, we can then attempt to focus on the interaction between the subsystems and the variation that exists as a result of their interaction. This task would be challenging, though once defined, educators will be better able to predict the outcomes of different educational modalities and modifications to the system in an efficient and effective manner.

Whether systems thinking is a possible strategy to integrate content into traditional curricula or simply a strategy to better understand a complex system, its use is an intriguing prospect. Its success in other complex systems, including the airlines, car companies, and more recently, the health care system, suggests that its use in medical education may yield similar results. As Dr. Donald Berwick M.D., a leader in healthcare reform and quality improvement, stated, “Every system is perfectly designed to achieve exactly the results it gets.” The medical education system is perfectly designed to produce students who lack qualities that will allow them to work effectively in a system. This system requires workers who can improve the system. Perhaps, it is time to use systems thinking to teach systems thinking.

“EVERY SYSTEM IS PERFECTLY DESIGNED TO ACHIEVE EXACTLY THE RESULTS IT GETS”
- Dr. Donald Berwick

Sources Cited:

About The Forum Periodical

The Forum is an editorial publication by students of the Pennsylvania State University College of Medicine that seeks to foster scholarly discussion in the academic body. Each issue will examine topics in the social and biomedical sciences, puzzles in clinical settings, and extraordinary experiences drawn from our faculty and students. We aim to present various perspectives in order to reach a deeper understanding of the issues confronting our rapidly changing world. Through The Forum, the unification of all sectors of the student body and faculty around today’s provocative issues will enhance our collective education.
Disparities in Care

Stephen Wagner, MS1

As a first year medical student I am constantly drawn into discussions with family and friends regarding health care reform. Heated arguments have raged about everything from the basic right to health care to appropriate levels of physician compensation. I would like to share a story about a recent experience I have had with the health care system that has caused me to change the focus of my arguments.

When playing basketball recently, I was coming down after leaping for a rebound and felt my left foot land on a teammate’s shoe instead of the hard solid, and at that moment desperately desired, floor of the gym. I sprained my ankle before I knew what was happening, without the time to formulate what that would mean in my head. The bills for years of neglecting strengthening exercises on my previously weakened ankle came due all at once as I hobbled off the floor. As the pain progressively worsened on the walk home, I resolved to work through this one as I had done before. However, when a night of elevation and icing resulted in a leg I could put no weight on, I visited a family practice nearby. Thanks to the kindness of my roommate, as I am not sure how I could have gotten there otherwise, I hobbled into the waiting room.

Fortunately a slot was found for me after I had exchanged my insurance card for a packet of forms. Since my ankle was probably not influenced by my grandfather’s diabetes, the form caused me nothing more than a raised eyebrow.

Throughout my first couple months of medical school, no professor has ever offered, “I see you have good health insurance!” as a way to greet the patient after entering the room. I wonder if that lesson is saved for third year as that was how I was greeted. He quickly deduced that, yes, I was indeed hobbling around the room and ordered an X-ray. I gladly took the X-ray and wished the tech a good day. She told me I would be called in a couple of days. As I left the office my physician gave me several prescriptions for some mild painkillers and also an aircast and crutches. After filling them at no cost to myself, I went home feeling that, while there are flaws in our healthcare system, there are some positive aspects as well.

As two weeks passed I reached the point where I could walk but not run, and so I eagerly awaited my follow-up. I also was concerned as the promised call regarding my X-ray had never materialized. At the follow-up visit, I was informed the X-ray was negative and was diagnosed with posterior tibialis tendinitis and then given a prescription of physical therapy after saying maybe 30 words to the doctor. Once again a reference was made to my insurance, and, at that point, heavy guilt set in. I had sprained my ankle and was getting great care, but care that I’m not sure I really needed and that would have been maybe unaffordable with weaker insurance. Consider the uninsured man who gets injured on the job working to provide for his family; what quality of care will he get with no insurance?

Health care costs in this country are going to stay out of control until health care itself becomes more equitable across all socioeconomic groups. The “haves”, such as me in this instance, seem to receive excess care that drives up costs. PT as well as the initial X-ray, while appreciated, were probably not necessary and contributed a small piece to the total health care costs in this country that eats 16% of GDP. The father with poor insurance is not getting the care that he needs and so he will be facing elevated health care costs down the road. I’m concerned that I don’t see anything in current health care reform to narrow this difference in care. Indeed, as more and more individuals receive health insurance, which I fully support, I suspect more and more individuals will have as impersonal experiences as mine.

“Where will the line be drawn between finding time to see every patient and ensuring that they each get the care they deserve?”

According to the Kaiser institute there are 60 million Americans without adequate access to a primary care provider. I suspect that that number will only increase as the currently 50 million uninsured Americans get insurance one way or another in the coming years due to enacted reform. While allowing everyone access to care is, in my opinion, a fundamental human right, I now worry exactly what that care will entail. Will it be a history filled out while the patient waits? Will the doctor I once had lunch with, who bragged about scheduling patients every five minutes, become the norm? As more and more physicians work for larger and larger organizations will the compassion and caring so absent from my visits be lost forever? Where will the line be drawn now between finding time to see every patient and ensuring that they each get the care they deserve? I do not here propose any solutions to these problems, but I merely mention them as something to ponder as we pass the one-year mark of health care reform.
Realities in Reform
Michael Weitekamp, MD, MHA, FACP

Professionalism may not be sufficient to drive the profound and far-reaching changes needed in the US health care system, but without it, the health care enterprise is lost.” —Lesser CS, et al. JAMA 2010

Healthcare reform in America has been imminent for decades. Each time a moral consensus seemed near, progress stalled in the face of partisan politics, entrenched special interests and creative media propaganda. Perhaps this time things will be different. Why? Well, for one thing, the United States is technically bankrupt — our national balance sheet shows total present and future liabilities pegged at approximately $74 trillion, nearly twice the worth of the entire U.S. economy.

If you have a hard time wrapping your head around one trillion of anything — you are not alone. Try thinking of it in seconds — one million seconds ago was about 11 days ago. One billion seconds ago, Richard Nixon was resigning the presidency in disgrace. One trillion seconds ago was approximately 29,000 BC and woolly mammoths still roamed the earth! Healthcare costs, present and future, are being paid for with borrowed money — borrowed from you, your children, grandchildren and foreign investors. Individual states are spending more on health care and pension promises than they can sustain — and unlike the federal government, they are obligated to run balanced budgets. The result is higher taxes and less spending on education, the environment, and critical infrastructure. This is the moral equivalent of eating our young! While America will spend in excess of $2.5 trillion this year on health care — three times more per capita than England or Canada — we have worse health statistics and leave 45-50 million uninsured, and millions more underinsured. Finally, medical expense is now the number one driver of personal bankruptcy in America — affecting not only the poor, but even those with middle and upper class incomes. History teaches us that only when a majority of citizens across the economic spectrum is touched will sweeping change in policy be viable."

If the PPACA was limited to expanding insurance coverage, with no measures to control costs and improve quality, it would never have seen the light of day. Payment reform will increasingly link reimbursement to “value” rather than volume of services. New models of care, such as the Patient-Centered Medical Home, Accountable Care Organizations, and Health Innovation Zones are proposed to focus on prevention, wellness, chronic disease management and population health. It is important to understand that in any population, poor health in only 20 percent of individuals accounts for 80 percent of health care cost. The promise is that organizations that accept accountability for defined outcomes/quality metrics, and demonstrate cost savings, should share in those savings. A new Center for Medicare and Medicaid Innovation (CMMI) will fund initiatives to study these new systems of population-based care. A new Patient-Centered Outcomes Research Institute will provide for the conduct of comparative clinical effectiveness research — what works and what does not... or, what should be paid for with public money and what should not. The Independent Payment Advisory Board established by the ACA will reign in costs by changing how providers are paid for services. Fee-for-service medical care reimbursement will eventually be replaced by bundled payments for “episodes of care” or population capitation models. ▶▶

"You can always rely on the Americans to do what is right... but only after they have exhausted every other possibility”

- Winston Churchill

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Additional elements of the ACA call for a national commission to review and recommend to Congress proposals regarding a healthcare workforce – physicians, advanced practice nurses, therapists, pharmacists, etc. – better aligned with the needs of population health. This should translate into expanded opportunity in the primary care fields and foster innovation in team-based training and practice. New funds for health information technology should lead to better use of personalized health records, virtual medicine applications, and the sharing of critical health information at the time of service to patients, wherever they are located.

With so many moral, ethical and financial arguments in its favor, how can health care reform fail? Well, when you have 17 percent of the gross domestic product oriented to the delivery of health care services… let’s just say you find significant vested interest in the status quo. Leaders can, at times, appear ideologically impaired and immune to facts. The leadership of the Republican majority of the 112th Congress has already promised to “save” America from “Obamacare.” Recall that legislation only authorizes things to happen – Congress still must appropriate funds to allow authorized activities to actually occur. One all too likely scenario is that key elements of the PPACA will be inadequately funded, which would jeopardize the entire proposal. The individual mandate to obtain insurance is currently being challenged in the courts. Without the ability to obligate individuals to have insurance, certain actuarial assumptions – the sick and the well “swimming” in the same actuarial pool – cannot work. Attempts to pay physicians for the time required to counsel patients and families regarding end-of-life care options are being portrayed as “death squads.” Senior citizen spokes-persons have taken up a battle cry to “keep government out of my healthcare”… and I will bet you were under the assumption Medicare and Social Security already are federal entitlement programs!

“Each of us must accept the professional challenge and work together to improve whatever system of care we find ourselves in now, and provide servant leadership in the new systems”

So, comprehensive national health care reform as put forward in the Patient Protection and Affordable Care Act of 2010 is by no means a sure thing. In the words of Machiavelli,

It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institutions and merely lukewarm defenders in those who stand to gain by the new ones.

—The Prince (1513).

What will not change are the fundamental facts we have reviewed. Unfunded liabilities for health care (and state pensions and Social Security) threaten us now and into future generations. Physicians know best where we can control costs, improve quality of care and enhance patient safety. We should not wait for Washington to give us the answers. Each of us must accept the professional challenge and work together to improve whatever system of care we find ourselves in now, and provide servant leadership in the new systems of care that must evolve.

**“SUCCESS IS THE ABILITY TO GO FROM ONE FAILURE TO ANOTHER WITH NO LOSS OF ENTHUSIASM”**

- Winston Churchill

References:


Dr. Weitekamp has been the chief medical officer of Hershey Medical Center for the past 12 years. He has been named the Robert G. Petersdorf Scholar-in-Residence at the Association of American Medical Colleges (AAMC) and will be on sabbatical next year in Washington, D.C., working on issues related to national health care reform and the potential impacts of federal and state policy decisions on the operations and organizational designs of academic medical centers.
Often absorbed in our jobs, studies, research and the daily humdrum of our lives it can be easy to develop a narrow field of vision of our world. Perhaps it is better to say that it can be difficult to sit back and take a 10,000 foot view of our role and its influence outside our daily world, and also assess the world’s influence on our own role. Works like the popular economic exploration *Freakonomics* take us out of our routine and remind us that the world is a large network of social interactions. The realm of medicine is no different as it influences and is influenced by numerous social ideas on how disease is accepted, defined, and recognized (or not recognized). The following examples of angina, suicide, and the homosexual identity come from *Framing Disease: Studies in Cultural History*, a collection of essays edited by Charles E. Rosenberg and Janet Golden that explores the social dimensions of disease.

The classification of medical ideas is a powerful tool in establishing prognosis, treatment, and accepting the disease. Significantly, it establishes the social role for physicians for without the conceptualization of disease there is no need for a healer. This is highlighted when one looks at how coronary thrombosis became central to the clinical course of angina and heart disease. Death due to heart failure was thought to be a functional disease of the heart with a spectrum of etiologies: neuronal derangement, sarcoidosis, rheumatic fever, and diseases of the aortic root were all thought to be independent causes of angina. One of the difficulties of connecting angina to coronary thrombosis, a pathological phenomenon readily accepted today, was the fact that angina has a myriad of presentations, and each presentation was attributed to a unique etiology. Up to the early 1900s, any unexplainable chest pain was often said to be angina. In his essay Christopher Lawrence argues that the difficulty in naming a new clinical disease came about through a difficulty in cognitively re-classifying heart disease from its old spectrum of classifications to coronary thrombosis as the main culprit. He believes that the social interest of a few individuals, who wanted to establish their own medical discipline, allowed for the cognitive impetus classifying coronary thrombosis induced angina as a routine disease. The medical specialty of cardiology, as argued by Lawrence, grew out of this re-classification as those who pushed this etiology of angina were experts in the diagnosis and wanted to establish their own specialized niche. Not only was a new professional community created, but also an medical identity for patients who have coronary thrombosis or experience angina. Today aspects of diet, lifestyles, medical screening, and the media are centered around the prevention and treatment of heart attacks as cardiology’s wisdom has become a major part of our society.

Society can also influence the medicalization of a disease just as much white coats influence the layman. Micheal Macdonald explores societies response to suicide in England and how changes in societal values turned suicide into a medical condition. From the medieval times suicide was considered a morally apprehensible act, considered an act of self-murder. Even after death, punishment was rendered. The body was interred in highways and the deceased’s property became forfeit to the King, and in doing so also punishing the decendants. Society was dominated by theological standards and so suicide was treated as a moral sin. As romanticism, humanitarianism, and general secularization of society became popular, people started to see this treatment of the suicidal as mislead and cruel. The coroner’s juries (medical examination by the coronor), in whom the society placed their faith in determining the cause of death, began to attribute the cause of death to lunacy instead of morality. The renowned philosophers of the time and upper class citizens followed suit. They attributed this cause, with the help of few physicians, to the accumulation of melancholic bile that resulted in lunacy. The same idea was used to save troubled criminals from the noose and instead brought them to lifelong prison. The changes in cultural and moral ideology of society lead to a medical explanation for suicide and changed the way a suicidal person was identified.

Perhaps Bret Hansen’s study on the “Discovery of homosexuals” is one of the most interesting studies on medicine’s influence on social framework. To be clear what is being discussed here is not homosexuality as a disease, as I do not believe it is a disease, but an evaluation of its recent history and how medicine contributed to the homosexual identity in America. Hansen presents a handful of fascinating accounts of physicians meeting their homosexual patients, and individual accounts of homosexuals discussing their sexual feelings. Near the 1880s and onward, a large number of medical writings began to surface on the medical theories on same-sex people. Physicians, that were known to be tolerant, were visited by willing individuals who were confused with their own feelings and feared that they were inherently corrupted. These individuals felt alone in their dilemma and many did not know anyone else that had the same same-sex ideation. They were diagnosed as “sexually inverted” and were encouraged by physicians to interact with the opposite sex, sometimes even to engage in heterosexual intercourse. Some physicians encouraged them to become comfortable with their own feelings and accept it as normal, although this view was not the norm. Many publications by
physicians identified same-sex behavior, and while they were morally opposed, the physicians also called for intervention to help the “afflicted”. One physician explained:

“Science has discovered that, amid the lowest forms of bestiality, there are phenomena which are truly pathological and which deserve the considerate attention and help of the physician.”

Initially, this was a belief held by the patients as well. This is illustrated in one description by a physician who was visited by a woman (first decade of 1900s):

“[she] feels at times sexually attracted by some of her female friends, with whom she has indulged in mutual masturbation. These feelings come at regular intervals, and are then powerfully excited by the sight of female genitals... She is aware of the fact that while her lascivious dreams and thoughts are excited by females, those of her female friends are excited by men. She regards her feelings as morbid.”

This account, while describing a woman’s fear of her feelings of attraction, also highlights the wide range of sexual activity and feelings seen at the time in homosexuals. In fact, it has been noted that cases existed of those that pursued affection for the same sex and did not seek physical attention. Many of these accounts were published and analyzed by physicians of the time. These physicians were not discriminating against homosexuals or trying to publish and heterosexual classes. A poignant example comes from an account of a lesbian woman, written in the 1970s, about her experience in 1914 when she had read writings by the medical authorities of sexual deviance, such as Edward Carpenter and Richard von Kraft-ebbing. Her response was:

“I could have no doubt, having read them, of where my orientation lay. Though...I couldn’t accept the morbidity side of it, it was interesting to read all this and to find out there had been other people like me before.”

Medical work contributed to shaping the idea of homosexuality and, along with numerous converging cultural factors, society absorbed this and formed the identity of homosexuality.

We may not always be cognizant of this interplay, the social framing of medicine, but it occurs everyday in our doctor-patient interaction. In this modern day, where the physician is in a position of power, what the patient is told about his disease, its prognosis, etiology are all collected by the patient and compared to his life experiences such as his familial traditions, education, religious beliefs and social stigmas to name a few. In the same way, meeting a patient in clinic validates a physician’s social function. As the famous line attributed to Hippocrates goes,

“The medical art consists in three things – the disease, the patient, and the physician.”

Reference:
EDITORIAL

Medicine’s Special Status in War

A Question for Readers

On April 7, the international medical humanitarian organization Doctors without Borders issued a report condemning the use of medical facilities in Bahrain to crack down on protestors.

“Wounds, especially those inflicted by distinctive police and military gunfire, are used to identify people for arrest, and the denial of medical care is being used by Bahraini authorities to deter people from protesting,” said Latifa Ayada, MSF medical coordinator. “Health facilities are used as bait to identify and arrest those who dare seek treatment.”

Since clashes began between government forces and protestors in February, health centers are no longer able to serve the medical needs of the whole population. With the Arab uprising sweeping across the Middle East, we have witnessed violent responses to protestors in Libya, Bahrain, Yemen, and Syria, to name a few. They have been in the streets mostly, but the attacks extends well beyond. Violence carried out by the state against citizens without due diligence is certainly to be deplored. There seems to be a categorical difference, however, between a crack down on protestors and violence targeting the medically needy. But why does a violation of the integrity of a medical center seem extraordinarily egregious?

In response to the events in Bahrain, the general director of Doctors without Borders, Christopher Stokes, asserted that, “all patients have a right to treatment in a safe environment, and that all medical staff have a fundamental duty to administer treatment without discrimination.” Few would dispute this statement, but we must ask ourselves not should this be the case, but why.

Although international humanitarian law (“military and civilian medical personnel and facilities must be respected and protected and must be granted all available help for the performance of their duties.” – International Red Cross) is a good moral compass and measuring stick for proper protocol, we are more concerned with the responsibility to healthcare that the events in Bahrain have raised: is there a difference between violence against protestors on the street and, on the other hand, infringing on the proper functioning of a medical facility as outlined above? If so, what is the nature of the difference, and what can it teach us about how medicine can or should be viewed?

Send your responses to theforumperiodical@gmail.com