



Reforming medical education: A review and synthesis of five critiques of medical practice

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ABSTRACT

For physicians to provide appropriate healthcare at a reasonable cost, health reform may not be enough. This essay discusses the scope of educational reform needed in the U.S. to train tomorrow's physicians to practice effectively in an increasingly complicated health care arena. We undertook a review and synthesis of five critiques of medical practice in the U.S.: of quality, evidence-based medicine, population medicine, health policy and heuristics. Our findings suggest that physicians are inadequately trained to function in the complex organizational and social systems that characterize modern practice. Successful health care reform in the U.S. will require physicians who are trained not only in bio-medicine, but also in the social sciences. Other developed countries, which have both greater government control of health care and a culture less oriented to individualism, may have less need for specific efforts to train physicians in the social sciences but could still benefit from considering an expanded curriculum. Effective educational reform must address the medical admissions process, academic and intellectual preparation, and professional and clinical training.

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Introduction

As the United States revisits health care reform, cost and quality, not just access, must be addressed. Will system reform, including changes in coverage mechanisms, payment incentives, and delivery structure, transform physician behavior to deliver appropriate health care at an affordable price, or are physicians and the way they are trained themselves part of the problem?

Physicians are no doubt highly skilled as a result of their biomedical education and clinical training, but based on an overview and synthesis of five critiques of medical practice, this essay argues that the lack of physicians' preparation in the social sciences may limit their ability to confront contemporary health care problems. These critiques have come from the vantage points of quality, evidence-based medicine, population medicine, policy, and heuristics. Collectively, they suggest that the basic tenets of physician socialization need to be challenged again – much as they were by Flexner 100 years ago. This will require significant reform of medical education, well beyond the scope of those proposed or adopted in recent years. In this review we consider 5 critiques of medical practice in the US: of quality, evidence-based medicine, population medicine, health policy

and heuristics. A synthesis of these critiques forms the basis of our assessment of the scope of educational reform needed to train tomorrow's US doctors.

Quality

The Institute of Medicine has published major reports on the high levels of error, iatrogenic injury, waste, and overtreatment in medical care. (Institute of Medicine, 2001; Kohn, Corrigan, & Donaldson, 2000) Despite its scale and scope, response to the “quality chasm” has been slow because reform efforts have ignored how physicians are trained to view errors. To reduce error and improve quality, physicians must be trained to focus on system design, not on individual failures. Yet, today's physicians expect perfection of themselves, (Leape, 1994) thereby discouraging error reporting and hindering system improvements that acknowledge fallibility and mitigate its consequences. In response to the medical culture of self-reliance, social science frameworks and methods could provide the perspective that physician training currently lacks. (Bhuiyan & Baghel, 2005; Colton, 2000) Improvements in medical practice require team work and the ability of team members, including physicians, to understand the social and cognitive frameworks in which other members of the team have been trained (Gittell, 2000; Whitehead, 2007).

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Evidence based medicine

Proponents of evidence-based medicine (EBM) note that much of medical practice in the 1980s–1990s was rooted in apprenticeship and expert opinion (Starr, 1982). EBM's focus on outcomes and evaluation of pooled clinical trial data has since continued to challenge clinical intuition, tradition, anecdotal experience, and patho-physiologic rationale as insufficient grounds for defending expensive, ineffective, or even harmful practices (Evidence-Based Medicine Working Group, 1992).

A literature review of the development, introduction, use and evaluation of four medical practices was undertaken. Two are screening tests: exercise testing for asymptomatic coronary artery disease (Fletcher et al., 1995; Fowler-Brown et al., 2004; Giagnoni et al., 1983; McHenry, O'Donnell, Morris, & Jordan, 1984) and prostate specific antigen assay (PSA) for pre-clinical prostate cancer (Catalona et al., 1991; Fowler et al., 1998; Harris & Lohr, 2002; Mitka, 2004; Sharifi & Kramer, 2007; U.S. Preventive Services Task Force, 1996; Voss & Schectman, 2001). Two are monitoring technologies intended to guide treatment decisions: electronic fetal monitoring (EFM) during delivery (American College of Gynecology Technical Bulletin 1995; Banta & Thacker, 1979, 2001; Graham, Petersen, Christo, & Fox, 2006; Greene, 2006; Hon & Hess, 1957) and pulmonary artery catheterization (PAC) for managing the critically ill. (Connors et al., 1996; Robin, 1985; Rubinfeld, McNamara-Aslin, & Rubinson, 2007; Shah et al., 2005; Wiener & Welch, 2007). All were rapidly and widely adopted despite a lack of evidence demonstrating clinical utility. Early enthusiasm was followed by data revealing limited benefits and in some cases potential harm. Evidence mounted, but the medical profession was slow to oppose the status quo, and even after guidelines were published, physicians were resistant to change.

All four examples demonstrate physicians' readiness to apply "science" based on technology and patho-physiologic data, but relative unwillingness to apply science based on empiric evidence and epidemiologic data. Physicians would benefit from training in a broader and more nuanced approach to the epistemological challenges inherent to how they consider evidence. (Goldenberg, 2009) In an era shaped by pressures to rapidly adopt new technology (Rothman, 1997) and by direct-to-consumer marketing, (Wolfe, 2002) such training may prove instrumental in efforts to curb overtreatment and contain healthcare costs.

Population medicine

Medicine and public health have long had a troubled relationship, (Starr, 1982) and debate about integrating population medicine into general medical education continues. Some have argued that physicians would be better clinicians if they were taught to apply a population perspective to clinical practice because they would be better trained to use clinical epidemiology and coordinate care with other community resources. (Allan et al., 2004; Maeshiro, 2008)

The methods of clinical epidemiology rest in part on selecting an appropriate denominator. (Sackett, 1991) Misplaced enthusiasm for the screening and evaluative tests discussed above can be partially attributed to applying findings from specific subsets of patients to broader populations. Similarly, the overuse of many medications stems from reliance on relative risk rather than absolute risk. (Gigerenzer & Edwards, 2003) Underutilization may also be explained by failure to use population denominators. Low levels of screening for alcohol and drug use, HIV, or depression, for example, might be the result of physicians not knowing the prevalence of subclinical disease present in their patients' communities.

With minimal education on the vast literature on social, economic, behavioral, and environmental determinants of health,

physicians with an exclusively biomedical focus may limit their interventions to bio-technology. They may, in turn, be less likely to partner with community resources, which can include family, social workers, schools, hospices, recreational facilities, and government agencies. Physicians trained with a population perspective should be better able to coordinate their care with community resources. (Gadon, 2007; Ockene et al., 2007) A broader perspective provided by a social science education would help physicians not only understand some of the social determinants of health but also intervene constructively, both through modifications in how they provide health services, and through a broader research and advocacy agenda (McCally et al., 2000).

Policy

Most clinicians know that health policy intrudes on the patient-provider relationship. The allotted time of the visit, payment structures, rules, formularies, referral networks, and third-party oversight all matter to what a patient and provider do. Some clinicians develop expertise in a range of policy issues, but the vast majority does not seek such knowledge and skills, or see it as their professional responsibility to constructively influence the policy environment. Medical schools and residencies have to varying degrees sought to teach health care policy, but not in ways that come close to matching the rigor of training in the biological sciences. (Cooke, Irby, Sullivan, & Ludmerer, 2006) Exposure to the political and social science discourse early and consistently in medical education might increase physician involvement in policy as well as help physicians better understand the value of coalition work in advocacy. (Chavis, 1995; Crosby, 1996; Elison, 1997; Zigler & Muenchow, 1984).

Heuristics

The public idealizes the physician as a master of all relevant information, who applies it rationally and judiciously; but, in reality, physicians are fallible. In a recent book intended primarily for a lay audience, Jerome Groopman summarizes errors in thinking in medicine. (Groopman, 2007) These include the availability and anchoring heuristics: the tendencies to settle early and too firmly on more likely or more recently encountered diagnoses; and affective and attribution errors: the tendencies to let emotion and stereotyping bias the approach taken to patients' illnesses. Groopman encourages patients to reduce medical error by recognizing these patterns and challenging their doctors. He also gives examples of excellent clinicians who self-monitor and suggests that each physician is obligated to understand and monitor heuristics. He does not, however, offer any recommendation as to how physicians might be trained to do so. Considerable social science research exists on strategies to minimize bias introduced by heuristics, and in some cases is being applied to the medical encounter (Schwab, 2008).

A proposed synthesis of critiques of medicine

What the above critiques of medicine have in common is an implicit recognition that medicine is practiced in a context of social and organizational structures distinct from its biomedical substrate. Understanding these structures is essential not only to health care reform, but also to delivering optimum medical care. They include the clinical environment and institution, the family and social milieu of the patient, the community and environment in which the patient lives, and the health care system and its structures of access, cost, and quality. They also include the personal attributes, identity, biases, and emotions of both the patient and

doctor. Physicians must be cognizant of the contextual systems surrounding medicine and adapt their practice in response. In short, physicians must be social as well as natural scientists.

Medical education: a call for systemic reform

This analysis points to the need for physicians to understand and value the social science disciplines if they are to work effectively in a medical context not shaped exclusively by the biomedical paradigm. Therefore, significant medical education reform must accompany reforms in system finance and delivery. Successful reform aimed at delivering appropriate, affordable health care will require physicians who are trained not only in bio-medicine, but also in the social science disciplines engaged in this complex milieu.

The Flexner revolution 100 years later

In 1910, Flexner observed that the scientific building blocks needed for a medical mind were already in place, but that they were not cemented together through applied learning. (Flexner & Pritchett, 1910) Seeing the improvements that scientific rigor could bring to patient care, Flexner proposed an educational model that wedded theory to clinical practice. What emerged was the modern academic medical center, where clinical practice and teaching could continually benefit from the methodology and discoveries of scientific research.

Today, however, the claim that clinicians are trained as scientists may be more rhetoric than reality. Diagnostic tools have become more numerous and complex, physician's routine application of science has been marginalized to laboratories and technicians, and medical training has reverted to a model shaped predominantly by anecdote. Today's medical student focuses on memorizing the existing biomedical canon rather than on asking new questions and applying research methods to answer them. In particular, they are markedly unprepared to think critically in the realm of the social sciences, and yet, as the critiques of medicine tell us, this is where they will encounter many of the challenges to delivering optimum medical care to their communities.

To be a scientist of medical care today involves much more than bio-medicine, just as it involved much more than hearsay following the microbiology revolution. For the physician in-training, the frameworks of quality improvement, evidence-based medicine, population health, policy, and heuristics are not made sufficiently relevant enough to clinical practice. A century ago, biological knowledge and the scientific method were integrated into medical training to the benefit of patient care. Today, reinvigorating that same methodology by way of the social sciences may be the catalyst needed to spark a new wave of quality improvement.

The scope of education reform

To date, the majority of medical education reform has confined social science training almost exclusively to the pre-clinical years. This approach is fundamentally flawed because it separates theory from practice, thereby diminishing the perceived relevance to patient care. An understanding of the contextual structures of practice should become a central part of education, taught not only in the classroom, but valued and applied scientifically at all levels of clinical training. Students and residents should have the opportunity to observe knowledge and skills in these areas applied by their mentors to improve patients' health. Attention to the social sciences should also be reflected in considering who is brought into the profession by recruiting students with talent and interest in these subjects. Effective reform must therefore stem from three

inseparable components: medical admissions, academic and intellectual preparation, and professional and clinical training.

Medical admissions

Motivated in part by the density of material taught in the pre-clinical years, medical schools have sought applicants with not just the capacity to understand natural science, but the ability to excel in competitive exams that stress memorization. Although qualitative factors assessed in the interview and personal statement have become increasingly valued, grade point average in the natural sciences and the medical college admissions test remain paramount. (Albanese, Snow, Skochelak, Huggett, & Farrell, 2003)

Applicants for medical school should be evaluated "whole cloth." All attributes required for a good physician should be considered, including but certainly not limited to their abilities in both the natural and social sciences. Clearly, ability in the natural sciences must be maintained at a level sufficient to understand the scientific basis of clinical care, but the admissions process should be structured to assure that attention to this ability does not crowd out other desired attributes. Even before they start their training, students should know the full range of abilities expected of them. This can only occur if all attributes are explicitly valued components of the admissions criteria.

Academic and intellectual preparation

Parts of the social science framework needed for medical practice can be found in many existing pre-clinical curricula and in the public health education available to some physicians in training. Perhaps more broadly, the profession should consider the challenge put forward by Jerome Groopman, who notes that a good physician needs "a searching mind," to self-reflect, avoid cognitive errors, and improve. (Groopman, 2007) Although students might not often think independently in training, one day – faced with a difficult patient in a difficult health system context – they will need to do so. Training should prepare them for such moments.

What kind of education encourages the development of "a searching mind"? A liberal arts education stimulates "searching" by prompting students to view the world critically through many disciplinary lenses, including the arts and humanities, as well as the social sciences. (Seifert et al., 2008) Such an education before and during medical training, might be an important compliment to the natural sciences in preparing physicians for the challenges of practice. Flexner himself complained that medicine was, "...sadly deficient in cultural and philosophical background." (Flexner, 1925)

Professional and clinical training

Flexner's critique is best re-applied in its place of origin: clinical training. Quality improvement methods, health systems and technology assessment research, clinical epidemiology, and management and behavioral sciences, must be applied to benefit each patient's care. Moreover, the relationship between the challenges of clinical practice and the influences of administrative and policy frameworks must be taught overtly and be embraced as part of a physician's required realm of expertise, rather than as the "bother" that "interferes with practice." Ideally, students and residents would have opportunities to conduct research in such areas as quality improvement, or health policy, or other systems aspects of care.

Residency curricula and faculty will have to change, and academic medical centers will have to reshape how they practice, and model, medicine. This may require that expertise be developed or imported into the academic medical center, as was the case after the Flexner report.

Conclusion

Medicine in the US is practiced in a complex organizational context, and good medical practice requires an ability to work knowledgeably in this context. Health care reform must be accompanied by changes in medical education, with more attention to the social sciences. Use of this broader education must be applied and modeled in clinical practice by the academic physicians who train medical students and residents, and it must inform the selection of future physicians.

References

- Albanese, M. A., Snow, M. H., Skochelak, S. E., Huggett, K. N., & Farrell, P. M. (2003). Assessing personal qualities in medical school admissions. *Academic Medicine*, 78, 313–321.
- Allan, J., Barwick, T. A., Cashman, S., Cawley, J. F., Day, C., Douglass, C. W., et al. (2004). Clinical prevention and population health: curriculum framework for health professions. *American Journal of Preventive Medicine*, 27, 471–476.
- American College of Gynecology Technical Bulletin. (1995). Fetal heart rate patterns: monitoring, interpretation, and management. Number 207–July 1995 (replaces No. 132, September 1989). *International Journal of Gynecology & Obstetrics*, 51, 65–74.
- Banta, H. D., & Thacker, S. B. (1979). Assessing the costs and benefits of electronic fetal monitoring. *Obstetrical & Gynecological Survey*, 34, 627–642.
- Banta, H. D., & Thacker, S. B. (2001). Historical controversy in health technology assessment: the case of electronic fetal monitoring. *Obstetrical & Gynecological Survey*, 56, 707–719.
- Bhuiyan, N., & Baghel, A. (2005). An overview of continuous improvement: from the past to the present. *Management Decision*, 43, 761–772.
- Catalona, W. J., Smith, D. S., Ratliff, T. L., Dodds, K. M., Coplen, D. E., Yuan, J. J., et al. (1991). Measurement of prostate-specific antigen in Serum as a screening test for prostate cancer. *New England Journal of Medicine*, 324, 1156–1161.
- Chavis, D. M. (1995). Building community capacity to prevent violence through coalitions and partnerships. *Journal of Health Care for the Poor & Underserved*, 6, 234–245.
- Colton, D. (2000). Quality improvement in health care: conceptual and historical foundations. *Evaluation and the Health Professions*, 23, 7–42.
- Connors, A. F., Jr., Speroff, T., Dawson, N. V., Thomas, C., Harrell, F. E., Jr., Wagner, D., et al. (1996). The effectiveness of right heart catheterization in the initial care of critically ill patients. SUPPORT investigators. *Journal of the American Medical Association*, 276, 889–897.
- Cooke, M., Irby, D. M., Sullivan, W., & Ludmerer, K. M. (2006). American medical education 100 years after the Flexner report. *New England Journal of Medicine*, 355, 1339–1344.
- Crosby, B. L. (1996). Policy implementation: the organizational challenge. *World Development*, 24(9 Spec. Iss.), 1403–1415.
- Elison, S. K. (1997). Policy innovation in a cold climate: the family and medical leave act of 1993. *Journal of Family Issues*, 18, 30–54.
- Evidence-Based Medicine Working Group. (1992). Evidence-based medicine. A new approach to teaching the practice of medicine. *Journal of the American Medical Association*, 268, 2420–2425.
- Fletcher, G. F., Balady, G., Froelicher, V. F., Hartley, L. H., Haskell, W. L., & Pollock, M. L. (1995). Exercise standards. A statement for healthcare professionals from the American Heart Association Writing Group. *Circulation*, 91, 580–615.
- Flexner, A. (1925). *Medical education: A comparative study*. New York: The Macmillan Company.
- Flexner, A., & Pritchett, H. S. (1910). *Medical education in the United States and Canada: A report to the Carnegie foundation for the advancement of teaching*. New York: Carnegie Foundation for the Advancement of Teaching.
- Fowler, F. J., Jr., Bin, L., Collins, M. M., Roberts, R. G., Oesterling, J. E., Wasson, J. H., et al. (1998). Prostate cancer screening and beliefs about treatment efficacy: a national survey of primary care physicians and urologists. *American Journal of Medicine*, 104, 526–532.
- Fowler-Brown, A., Pignone, M., Pletcher, M., Tice, J. A., Sutton, S. F., & Lohr, K. N. (2004). Exercise tolerance testing to screen for coronary heart disease: a systematic review for the technical support for the U.S. Preventive services task force. *Annals of Internal Medicine*, 140, W9–W24.
- Gadon, M. (2007). Revisiting the social contract: physicians as community health promoters. *Preventing Chronic Disease*, 4, A39.
- Giagnoni, E., Secchi, M. B., Wu, S. C., Morabito, A., Oltrona, L., Mancarella, S., et al. (1983). Prognostic value of exercise EKG testing in asymptomatic normotensive subjects. A prospective matched study. *New England Journal of Medicine*, 309, 1085–1089.
- Gigerenzer, G., & Edwards, A. (2003). Simple tools for understanding risks: from innumeracy to insight. *British Medical Journal*, 327, 741–744.
- Gittel, J. H. (2000). Organizing work to support relational co-ordination. *International Journal of Human Resource Management*, 11, 517–539.
- Goldenberg, M. J. (2009). Iconoclast or creed? – objectivism, pragmatism, and the hierarchy of evidence. *Perspectives in Biology & Medicine*, 52, 168–187.
- Graham, E. M., Petersen, S. M., Christo, D. K., & Fox, H. E. (2006). Intrapartum electronic fetal heart rate monitoring and the prevention of perinatal brain injury. *Obstetrics & Gynecology*, 108, 656–666.
- Greene, M. F. (2006). Obstetricians still await a deus ex Machina. *New England Journal of Medicine*, 355, 2247–2248.
- Groopman, J. E. (2007). *How doctors think*. Boston: Houghton Mifflin Co.
- Harris, R., & Lohr, K. N. (2002). Screening for prostate cancer: an update of the evidence for the U.S. Preventive services task force. *Annals of Internal Medicine*, 137, 917–929.
- Hon, E. H., & Hess, O. W. (1957). Instrumentation of fetal electrocardiography. *Science*, 125, 553–554.
- Institute of Medicine (U.S.), & , Committee on Quality of Health Care in America. (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: National Academy Press.
- Kohn, L. T., Corrigan, J., Donaldson, M. S., & , Institute of Medicine (U.S.). Committee on Quality of Health Care in America. (2000). *To err is human: Building a safer health system*. Washington, DC: National Academy Press.
- Leape, L. L. (1994). Error in medicine. *Journal of the American Medical Association*, 272, 1851–1857.
- Maeshiro, R. (2008). Responding to the challenge: population health education for physicians. *Academic Medicine*, 83, 319–320.
- McCally, M., Haines, A., Fein, O., Addington, W., Lawrence, R. S., & Cassel, C. K. (2000). Poverty and ill health: physicians can, and should, make a difference. In P. Brown (Ed.), *Perspectives in medical sociology* (3rd ed.). (pp. 5–20) Prospect Heights, Illinois: Waveland Press, Inc.
- McHenry, P. L., O'Donnell, J., Morris, S. N., & Jordan, J. J. (1984). The abnormal exercise electrocardiogram in apparently healthy men: a predictor of angina pectoris as an initial coronary event during long-term follow-up. *Circulation*, 70, 547–551.
- Mitka, M. (2004). Is PSA testing still useful? *Journal of the American Medical Association*, 292, 2326–2327.
- Ockene, J. K., Edgerton, E. A., Teutsch, S. M., Marion, L. N., Miller, T., Genevro, J. L., et al. (2007). Integrating evidence-based clinical and community strategies to improve health. *American Journal of Preventive Medicine*, 32, 244–252.
- Robin, E. D. (1985). The cult of the Swan–Ganz catheter. Overuse and abuse of pulmonary flow catheters. *Annals of Internal Medicine*, 103, 445–449.
- Rothman, D. J. (1997). *Beginnings count. The technological imperative in American health care*. New York: Oxford University Press.
- Rubinfeld, G. D., McNamara-Aslin, E., & Rubinson, L. (2007). The pulmonary artery catheter, 1967–2007: rest in peace? *Journal of the American Medical Association*, 298, 458–461.
- Sackett, D. L. (1991). *Clinical epidemiology: A basic science for clinical medicine* (2nd ed.). Boston: Little Brown.
- Schwab, A. P. (2008). Putting cognitive psychology to work: improving decision-making in the medical encounter. *Social Science & Medicine*, 67, 1861–1869.
- Seifert, T. A., Goodman, K. M., Lindsay, N., Jorgensen, J. D., Wolniak, G. C., Pascarella, E. T., et al. (2008). The effects of liberal arts experiences on liberal arts outcomes. *Research in Higher Education*, 49, 107–125.
- Shah, M. R., Hasselblad, V., Stevenson, L. W., Binanay, C., O'Connor, C. M., Sopko, G., et al. (2005). Impact of the pulmonary artery catheter in critically ill patients: meta-analysis of randomized clinical Trials. *Journal of the American Medical Association*, 294, 1664–1670.
- Sharifi, N., & Kramer, B. S. (2007). Screening for prostate cancer: current status and future prospects. *American Journal of Medicine*, 120, 743–745.
- Starr, P. (1982). *The social transformation of American medicine*. New York: Basic Books.
- U.S. Preventive Services Task Force. (1996). *Guide to clinical preventive services: Report of the U.S. Preventive services task force* (2nd ed.). Baltimore: Williams & Wilkins.
- Voss, J. D., & Schectman, J. M. (2001). Prostate cancer screening practices and beliefs. *Journal of General Internal Medicine*, 16, 831–837.
- Whitehead, C. (2007). The doctor Dilemma in interprofessional education and care: how and why will physicians collaborate? *Medical Education*, 41, 1010–1016.
- Wiener, R. S., & Welch, H. G. (2007). Trends in the use of the pulmonary artery catheter in the United States, 1993–2004. *Journal of the American Medical Association*, 298, 423–429.
- Wolfe. (2002). Direct-to-consumer-marketing – education or emotion promotion? *New England Journal of Medicine*, 346, 524–526.
- Zigler, E., & Muenchow, S. (1984). How to influence social policy affecting children and families. *American Psychologist*, 39, 415–420.