



The Role of Science in Medical Education in the USA Today

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Good Morning, Ladies and Gentlemen!

I want to express my thanks to the organizers of the conference. I am honoured to be invited to this event. Especially, I want to thank the organizers for the opportunity to say something about contemporary medical education in the United States.

Like Flexner, I'm not trained in medicine. My background is quite different, since I started in Philosophy and moved to Sociology. For over a decade I directed several studies on professional education of which medicine was one. We also looked at legal education; we looked at Jewish or Christian seminaries for the training of clergy. We looked at schools of nursing and at undergraduate schools of business. So we evaluated medical education by seeing other forms of professional education. These studies were carried out by research teams which consisted of members from different fields. So I will tell you some aspects from the point of view of an "outsider".

A century is, by any standards, a milestone. The title of this conference testifies to the staying power of Abraham Flexner's blueprint for modern medical training, prepared for The Carnegie Foundation for the Advancement of Teaching and presented in his famous Report of 1910. The concerns about science in today's medical preparation, however, also reveal stresses in the original design and open potentially fruitful new lines of thought about

changing and updating that model of preparing physicians. In the United States, a century after Flexner, with not only medicine but professional training of all sorts firmly implanted in the university, there are real questions about how to evaluate the benefits and costs of what has been rightly called a Flexnerian "revolution" in professional education.

In outline, Flexner's achievement is well-known. Impressed by the strongly scientific model of German medical training, pioneered in the U.S. at Johns Hopkins University, Flexner urged moving all medical training into the university. Physicians were to be trained at the graduate level, starting with two years of intensive courses in the basic sciences, but then moving into two years of clinical rotations in a university-affiliated "teaching hospital." This new institution was to be staffed by physician-educators dedicated to teaching (and paid to do so rather than support the hospital through fees for patient care). The aim was a generally educated physician, a professional rather than a technician, who could think broadly about health and disease within a scientifically-based profession dedicated to the care of patients and society's health. In its emphasis on integrating science into clinical training, the Report proved prophetic, though it did not anticipate the extension of medical training beyond an internship into years of specialized residency beyond the M.D.

The larger goal of the study was to raise the quality as well as the standing of medical care in the U.S. With the strong backing of the American Medical Association (AMA), Flexner's design became the basis of future medical education. The effects were good for improving quality and for medicine's prestige as a field in both the U.S. and Canada, as the AMA's leadership hoped. The Report proved much less productive of social inclusion for African-Americans and women within the ascending profession.

Beyond medical training, however, Flexner's insistence on the university as the proper setting for training professionals had profound effects on other fields, as did his prescription of formal, scientific knowledge as the portal to the domain. Other aspiring professions, such as engineering, business, social work, teaching, and later nursing, would follow this same approach. (Law

had already begun its own move into the university a generation before Flexner with the new Harvard Law School model.) No other field, however, developed the degree of integration of clinical training with formal knowledge and research that the academically sited medicine center made possible. The Carnegie Foundation for the Advancement of Teaching was founded by Andrew Carnegie near the beginning of the twentieth century. Under its first president, Henry Pritchett, it commissioned a number of other "surveys" of professional education besides medicine. But none had the impact of Flexner's Report. At the end of the 20th century, the Foundation's eighth president, Lee Shulman, initiated a new series of studies of professional education, the Preparation for the Professions Project, to investigate training for law, the Jewish and Christian clergy, engineering, nursing, and medicine. Reports on the two latter studies will be issued in late 2009 and early 2010¹, under the leadership of Carnegie's ninth president, Anthony S. Bryk. Compared to the early twentieth century reports, the current series has been carried out with two unique emphases. First, each study has been consciously conducted within a cross-professional perspective, looking for distinctive as well as common features of the training of various professionals. Second, the research has been importantly influenced by the learning sciences, a body of knowledge not available to Abraham Flexner, but one that has for a generation been exerting important influence on the development of teaching and learning at all levels of medicine in the United States.

Educating Physicians, The Carnegie Foundation's 2010 Update of Flexner

The integration Flexner had hoped academic medical training would assure between the sciences and the practical, ethical, and professional dimensions of medicine remains a challenging target. The huge increase in medical

¹*Educating Physicians: A Call for Reform of Medical School and Residency* by Molly Cooke, MD, David Irby, Ph.D., Bridget O'Brien, Ph.D. (San Francisco, CA: Jossey-Bass, 2010), and *Educating Nurses: A Call for Radical Transformation* by Patricia Benner, Ph.D. and Molly Sutphen, Ph.D. (San Francisco, CA: Jossey-Bass, 2009).

knowledge, technology, and specialization of recent decades has interacted with a now near-chaotic system of health care delivery to magnify the challenges facing medical education. Physicians have been trained as individual decision-makers but find themselves increasingly in a world of team care and evidence-guided practice. Physicians must become more rather than less eager to continue growing in their knowledge and yet medical education and heavy workloads do little to foster curiosity. The learning sciences make clear the superiority of engaged, contextual learning, but the inherited curricula and pedagogies are uneven and hard to change in this regard. Professionalism, both as devotion to patient care and ethical, collegial responsibility, has been an add-on when more complex conditions of practice make it essential. Even the knowledge base – which Flexner placed as the keystone of his edifice – now seems too narrow. Indeed, to the Flexnerian problem of integrating scientific theory with clinical experience, today's discussion includes advocates for a more truly inter-disciplinary model of medical education. They produce strong arguments that population medicine, medical anthropology, organizational knowledge, and medical humanities – subjects and intellectual competences sometimes described as typical of "liberal education" – join the biological disciplines as the "knowledge base" physicians need to draw upon. And there is much experiment and debate about how these things are to be taught in order to stimulate life-long scientific curiosity and interest.

Ours is clearly a time of ferment in medical education, as for the first time since the 1970s, new U.S. medical schools are under design and coming into operation. So, it seems an apt moment to consider the values of the Flexner legacy, to assess its strengths for confronting today's problems, to criticize its shortcomings, and to build upon its insights. The frontiers of today's medical education point in several directions. There is a need to motivate continuous learning and improvement across the whole arc of medical training, through residency and beyond in practice. At the same time, efforts are underway to link medical training, as well as practice, more intimately and effectively with public and community health needs. The future of medicine seems likely to involve physicians working more in multi-

professional teams in a variety of clinical settings. Hence, the great need to explore more effective ways to prepare doctors for interprofessional practice and learning, especially with nurses and the allied health professions. Along with these developments, professional identity and purpose has to be cultivated and supported more consistently amid the complexities of modern systems of prevention and care. Finally, given these complexities: how should the sciences so fundamental to medicine as an intensively science-using profession, be integrated into future preparation of physicians?

The 2010 Carnegie study, *Educating Physicians*, by Molly Cooke, M.D., David Irby, Ph.D., and Bridget O'Brien, Ph.D., is structured by four major recommendations, all rooted in what the authors sees as a needed rethinking and renewal of Flexner's model:

- 1) Medical education should be more standardized and yet more individualized,
- 2) Medical education should be more integrated,
- 3) Medical education should focus on inquiry and improvement of learning, knowledge and practice, and
- 4) Medical education should tend more to the formation of professional identity.

The issue of the role of science is most prominent in recommendations two and three – more integration in the curriculum and more stimuli for inquiry and improvement – and accordingly I will focus on these.

First: what are the problems that need to be addressed? For the sake of brevity, I will quote the authors of the report:

"Medical training is inflexible, overly long, and not learner-centered. Clinical education for both students and residents excessively emphasizes mastery of facts, inpatient clinical experience, teaching by residents and supervision by clinical faculty who have less and less time to teach, and hospitals with marginal capacity or willingness to support the teaching mission. We observed poor connections between formal knowledge and experiential learning and inadequate attention to patient populations, health care delivery, patient

safety and quality improvement. Learners lack a holistic view of patient experience and poorly understand the broader civic and advocacy roles of physicians. Finally, the pace and commercial nature of health care often impedes the inculcation of fundamental values of the profession." (Irby et al. "Calls for Reform of Medical Education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010", 2009, p. 11)

In contrast, the authors state:

"We envision a medical education system that maximizes flexibility in the achievement of standardized outcomes, creates opportunities for collaborative learning, inculcates habits of inquiry and improvement, and provides a supportive learning environment for the professional formation of students and residents - all the while advancing the health of patients and patient populations. These are four themes:

- 1) standardize on learning outcomes and individualize the learning process,
- 2) integrate formal learning with clinical experience,
- 3) incorporate habits of inquiry and improvement into medical education at all levels, and
- 4) focus on the progressive formation of professional identity." (Irby et al. *ibid.*, p.13)

Now, to focus in on the teaching of science. The first theme is "integration." The authors use the word integration to refer to the integration of formal knowledge of the basic, clinical and social sciences with clinical experience in a much more balanced manner than is true today. This means that medical students should be provided with early clinical immersion and residents should have more intense exposure to the sciences and best evidence underlying their practice. Integration also includes using that knowledge and experience to understand patients, their experiences and their care more holistically. Finally, in a sense of the word that is broader than Flexner's concept, the authors see integration as learners taking on the multiple professional roles and commitments associated with being a physician. Since physicians perform a variety of roles, such as educator, advocate, innovator, investiga-

tor, administrator, students and residents must integrate those additional roles into their professional aptitudes, goals and identities.

Educating Physicians envisions an educational process that more adequately represents the integrated nature of physicians' learning and work. This means providing earlier opportunities for students to spend time with patients and families, physicians, and other health care professionals in real as well as simulated clinical settings. Such experiences can cultivate a rich foundation upon which students can build formal knowledge, understand patient experiences and the contributions of different parts of the health care system, and start to conceptualize the multi-faceted roles of physicians. Likewise, more advanced learners need time away from direct clinical responsibilities so that they can engage substantially in other physician activities, including management of the delivery of health care services, quality improvement initiatives, community work, advocacy, or activities with their professional organizations, as their interests take them.

The report makes the following recommendations related to integration:

- Connect formal knowledge to clinical experience, including early clinical immersion and adequate opportunities for more advanced learners to reflect and study.
- Integrate basic, clinical and social sciences.
- Engage learners at all levels with a more comprehensive perspective on patients' experience of illness and care, including more longitudinal connections with patients.
- Provide opportunities for learners to experience the broader professional roles of physicians, including educator, advocate, investigator.
- Incorporate interprofessional education and teamwork in the curriculum.

Habits of Inquiry and Improvement

To promote excellence throughout a lifetime of practice, physicians-in-training should be engaged in inquiry, discovery and innovation. Insistence

on excellence involves developing the habits of mind and heart that continually advance medicine and health care.

The question of course is "how to do that?". To give you a flavour I will cite from an Editorial that appeared in "Science", September 24, 2010, written by one of the authors of the report, Molly Cooke². She writes

"A basic science education establishes a foundational understanding on which medical practice is, or should be, based. Effective patient care increasingly requires that physicians keep pace with rapidly evolving technologies and treatments, continually assimilating a vast amount of new and complex information. Indeed, studies have shown that both experienced and novice physicians form more coherent, durable, and flexible understandings of diseases and their treatments when they can link conditions to basic science concepts.

But there is an even more compelling reason to make basic science education essential for all physicians: stimulating curiosity and creating the scientific habits of mind that are essential for continual learning. Basic science research is a portal to the next generation of medical care. Thus, it is critical that both medical students and residents gain experience in critically assessing and interpreting research, not just in terms of outcomes and clinical effectiveness, but also in the context of biological plausibility and mechanisms. In addition, physicians and physicians-to-be must become familiar with those emerging areas of biomedical science with a potential to affect patient care. Under what circumstances, for example, will personal genome sequences become important for patient care, and what problems and opportunities will they create for a physician?

Engagement with science also must extend far beyond the first two years of medical school in order to develop 'the intellectual flexibility on which adaptive expertise depends.'³ Despite the increased attempts at integration in re-

² Cooke, M., *Science for Physicians*, Science 329 (2010), 1573

³ Cooke, M., Irby, D.M., O'Brien, B.C., *Educating Physicians: A Call for Reform of Medical School and Residency*, San Francisco, CA: Jossey-Bass, 2010

cent decades, science remains too sequestered in the curriculum, and passive instructional approaches focus on what is already known at the expense of engaging learners in what needs to be discovered. Teaching must emphasize not only today's knowledge, but also the methods and paths of reasoning that led to it. ... "

Throughout the continuum of medical education, students, residents, and practicing clinicians need to devise and implement changes that will increase the effectiveness of practice and improve care for their patients. The report suggests that training for inquiry and improvement requires moving beyond routine expertise to stretch the knowledge of the learner. The key to preventing "tapering off" or complacency in practice seems to be investing the effort needed to explore and address difficult or ambiguous problems. Research suggests that these are habits of mind that must be developed alongside routine expertise rather than after it. Adaptive experts stretch their knowledge even in routine situations.

The implications of this for curriculum reform might be to explicitly teach about adaptive expertise and its acquisition, engage learners in an uncertain and unfamiliar context to learn how to adapt prior knowledge to new circumstances, and assign students and residents to quality improvement projects. To accomplish this, the Carnegie authors recommend the following:

- Prepare learners to attain both routine and adaptive forms of expertise.
- Engage learners in challenging problems, and allow them to participate authentically in inquiry, innovation and improvement of care.
- Engage learners in initiatives focused on population health, quality improvement and patient safety.

Locate clinical education in settings where quality patient care is delivered, not just in university teaching hospitals.

It is easy to say, but difficult to practice.

If you want a learner to learn something, the key is to make clear to the learner what it is, what you want that person to learn. Then to model that

knowledge element, and then to provide opportunity for the learner to practice it and to receive intelligent feedback on that practice.

It is a rather simple threefold process that educators often forget.

As medical education enters its second century after Flexner, the most fitting tribute is to build on his legacy, using the knowledge and experience gained to innovate in order to foster the profession's highest aims under new conditions and in new ways.

Thank you!