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A Medical Model for Criminalistics Education

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ABSTRACT: The history of medical education during the period of 1870 to 1926 is examined in the context of current issues confronting education in the forensic laboratory sciences. Medical education was radically altered during this period, changing from a rudimentary lecture/apprenticeship system into its modern form.

Although the motivating forces had developed over some time, the actual change was quite rapid. By examining how this change occurred, we gain insight into how changes in our own profession might be initiated.

Parallels between our current situation and that in medical education 117 years ago include: (1) the primary burden of professional education is borne outside the university in an apprenticeship system, (2) the apprenticeship system is overburdened by a dramatic expansion in the knowledge and skills needed for professional practice, (3) there is no standardized curriculum or accreditation process for educational programs, and (4) there is no educational program that incorporates formal clinical education.

Based on this historical analysis, three major goals are proposed: (1) active entreprenurial promotion of professional educational programs by academics, (2) creation of a committee within the American Academy of Forensic Sciences to critique and rate university programs, and (3) the development of a well-defined clinical education program.

A model for formalized clinical education in the forensic laboratory sciences is proposed, incorporating clinical professors, student clerkships, and university control over instruction within an operational forensic science laboratory. Benefits from this arrangement include: efficient combination of physical plants, added personnel resources in the laboratory, rapid introduction of research into the laboratory, enhanced prestige for both academics and practitioners, and relief of the laboratory's in-house training burden.

KEYWORDS: forensic science, symposium, education, criminalistics, laboratories, medical education, clinical education, teaching laboratories

There has been remarkable professional growth in the forensic laboratory sciences during the last decade. We have seen the introduction of proficiency testing and laboratory certification, increased opportunities for continuing education, emergence of research centers, growth of professional organizations, adoption of ethical codes, and increased specialization among practitioners. Yet despite this professional growth, there remains an awkward uncertainty regarding the role of formal education in the forensic laboratory sciences. This poorly defined role is out of step with the overall professional development and is cause for serious concern on the part of both academicians and practitioners. Neither group is well-served by the existing system [*1*].

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This paper considers these circumstances in a broader perspective, drawing parallels to the development of medical education in the United States during the period of 1870 to 1926. It is during this period that the structure of medical education changed from a rudimentary lecture and apprenticeship system into its modern form. Although the forces motivating this change had developed over some time, the actual change was quite rapid. By examining how this change occurred, we gain insight into how changes in our own profession might be initiated.

Present Status of Forensic Laboratory Science Education

Formal instruction in the forensic sciences is not a prerequisite to employment in most crime laboratories, and practitioners are divided on the issue of whether a degree in criminalistics or the forensic laboratory sciences is even useful. A solid body of crime laboratory directors have a preference to hire chemists; exposure to the forensic sciences is considered desirable, but less critical than a thorough understanding of chemistry [*1,2*]. Why is this? An American Chemical Society (ACS) certified B.S. in chemistry offers a known and highly desirable background. A criminalistics or forensic science degree is more difficult to evaluate. Lack of standardization and accreditation among forensic science programs means that each program must be carefully scrutinized. Generalizations are difficult because there are small numbers of graduates and variations in quality may simply be due to the particular student or instructor involved. Even so, an applicant's performance in chemistry courses and the number of chemistry courses taken are the predominant evaluation criteria.

Without a standardized and relevant university education, a substantial amount of fundamental instruction must be provided within the individual forensic science laboratories [*3*]. There is either a prolonged, informal apprenticeship, or a more formal training period. In some laboratories the training is extensive, and takes on the character of a professional degree. Although laboratory control over training is often viewed as desirable in itself, it is usually acknowledged that a relevant university program would at least be a very useful and efficient supplement [*4*].

Practitioners are generally supportive of the existing university programs. Laboratory directors universally welcome student internships, and practitioners are quite open about what they would like to see in a degree program. There should be a strong, adaptable scientific background, specific knowledge and skills in routine forensic laboratory practice, realistic casework-type experiences, critical problem-solving skills, and exposure to the requirements and realities of courtroom testimony [*3*]. The problem is that there is no forensic science degree program that meets these needs. In this, academic forensic scientists have, collectively, failed.

It is not through a lack of effort and innovation on the part of individual educators that this failure has occurred. As one reflects on Berkeley's School of Criminology and programs at the University of Pittsburgh and Northeastern University, it is apparent that some of the best and most promising programs have been discontinued because of a lack of financial and administrative support [*4*]. There have been, and to some extent are, programs that serve the profession, but these have not been eagerly accepted in the academic setting.

To those who study the sociology of professions the forensic laboratory sciences are enigmatic.[2] As noted earlier, our profession has many features of advanced development, but one crucial feature is lacking: there is no organized control over the entry of individuals into the profession. Without such control professional identity is usually not maintained. It is peculiar that the forensic laboratory sciences could develop to their present level and remain distinct from, for example, analytical chemistry.

[2]Based on discussions with Dr. Marcia Lipetz, Center for Educational Development, University of Illinois at Chicago, November 1986.

How *have* we retained our identity? We have retained it because entry into the forensic laboratory sciences is tightly controlled, although not in any organized, professional manner. The special institutional role that forensic scientists play, juxtaposed between law enforcement and the courts, provides a functional definition of professional practice. What are the entry requirements? Employment and function. One joins the profession when one is hired by a crime laboratory and when one begins to write reports and to testify in court. In effect, the entry gate of our profession has been delegated to individual civil service boards and to individual judges. Educational requirements, such as they are, are determined by individual laboratories.

Some laboratories have responded admirably to these circumstances, instituting extensive training programs and even university affiliations,[3] but there are three critical weaknesses in this system [*3*]. The first is that there are no uniform educational standards. One laboratory's hiring practices and in-house training may be excellent, but in another jurisdiction they may be deplorable. The second weakness of this system is its cost. Only in the most exceptional of operational laboratories will it be financially feasible to maintain a comprehensive, state-of-the-art training facility and to dedicate laboratory personnel to full-time training. The third weakness is the system's instability. The quality of training will be dependent on continued budgetary support. Inasmuch as education is not the mission of a public service laboratory, it will necessarily take on secondary importance when funding becomes restricted or when services are in great demand. These three weaknesses, lack of uniformity, high cost, and instability, accent the need for university involvement and standardization of minimum educational requirements.

Unfortunately, to date there has been no coordinated effort among academics to create a standard curriculum or to produce any fundamental change. The ill-defined relationship between education and practice thus remains. As long as this is the case, academic programs can expect little security or support, and educators will have little fundamental influence over the profession. Presumedly, however, there will come a time when, like virtually every other profession, the university will play an acknowledged and indispensable educational role. How might educational programs in the forensic laboratory sciences be developed in a lasting and relevant way? Examination of the history of medical education provides insight into this problem.

Educational Development in the Medical Profession [*5*]

In 1870, formal medical education consisted of a four-month term of lectures. In the view of the day, all the information a doctor would ever need could be memorized within these four months. The lectures were followed by an *optional* period of unstructured apprenticeship and then professional practice. In this lecture-apprenticeship system there were no entrance requirements, no written examinations, no laboratory exercises, no clinical work with patients, and no university affiliations. The instructors were practicing physicians who taught during their off-hours and who divided the students' fees among themselves. Often the entrance requirements were deliberately kept low to ensure that there would be a sufficient student population for profitable operation.

Although some deficiencies in this lecture-apprenticeship system were recognized, the system had been in place for many years and it served medical practitioners acceptably. There had been reform efforts prior to 1870, but these had addressed the more trivial educational issues such as increasing the length of instruction, making apprenticeships mandatory, and establishing entrance requirements.

The major intellectual barrier to fundamental reform was a failure to recognize medicine

[3]Virginia Bureau of Forensic Sciences with Virginia Commonwealth University, 1987.

as a scientific endeavor. *Science* was seen as a topic distinctly different from medicine. Experimental methods were viewed as having nothing to do with the practice of medicine and nothing to offer in the way of medical research. Under the dominant medical tradition, medicine was the art of observation and the knowledge of symptoms and remedies. There was no concept of medical experiment, testing, or laboratory research.

With the progress of experimental science, and growth of the university system in the United States, forces arose that pressed for change.

Most importantly, there was the growth of knowledge itself. The germ theory of disease brought rapid technological changes and new methods of scientific inquiry. Neither of these could fit reasonably into the old educational system. Teaching became more demanding. No one could find the time to practice medicine, learn the newer methods, and then teach them to students in one's off-hours. The educational system no longer served the practitioner's needs and serious students left for Europe to attend the universities where the pioneering medical advances were being made.

The teaching methods in Europe stressed principles rather than facts, how to evaluate critically new information and how to adapt to changing technology. This type of instruction was much more difficult. One needed to select *what* to teach and *how* to teach it. The professors did not engage in independent practice, but were institutionally supported in their full-time teaching and research.

Meanwhile a growing number of scholars, returning from Europe, wanted to emulate their professors: to teach and to pursue research. In the United States, however, there was no setting to do so. The part-time lecture/apprenticeship system could not accommodate them. These would-be academics took on the entrepreneurial task to professionalize academic medicine and to develop institutional support for full-time teaching and medical research.

During this period, U.S. universities were developing as centers of excellence in fundamental learning. Extension to professional education in medicine, long dismissed as merely vocational training, began to be appealing with the emergence of medical science. The public service function of universities, and the prestige of association with the new medical advances, were motivating factors.

An old, ineffectual system of medical education, the presence of medical scientists seeking academic support, and a university system more open to professional education combined to create an environment conducive to fundamental change.

The first change occurred at Harvard when Charles Elliot was elected the University president in 1869. Before that time the medical school operated independently and had only a loose university affiliation. Elliot, however, brought Harvard Medical School under strict university control. Over the next several years a series of fundamental, pioneering changes were made. For the first time in any medical school a three-year curriculum of sequenced courses was introduced, laboratory courses were included, and full-time faculty were hired. These were the first academic positions in medicine in the United States. Entrance requirements were upgraded and strictly enforced.

There was a great deal of controversy regarding Elliot's changes. The former part-time instructors, who were among the most eminent practitioners, fought the new university control. Who was to control education: academics or practitioners? More fundamentally, what was the role of the school, to train physicians or to train scientists? Today we cannot conceive of medicine without science, but in 1869 the relevance of science to medicine was hotly contested. Elliot, however, had a strong scientific background and was committed to scientific reforms in medical education.

Apart from conflicts over control and academic philosophy, the major concern was that the longer and stricter curriculum would cause enrollments to drop, dooming the school. In fact, students were attracted to the higher quality of the program and the great success at Harvard forced other schools to upgrade their curricula. Most notably, pioneering reforms followed at the University of Pennsylvania and the University of Michigan.

The second and most radical change in medical education came with the opening of Johns Hopkins Medical School in 1893. This school was privately funded, very selective, and idealistic. For the first time a bachelors degree was required for admission to medical school. There was a four-year curriculum with two years of basic sciences and laboratory courses, followed by two years of clinical instruction in Johns Hopkins' own teaching hospital. This formal clinical instruction was the major innovation. Students actually cared for patients and then met and discussed their cases with clinical instructors. In other schools there had been optional or honorary hospital internships, where patients were cared for in the presence of students. This new system was quite different: the students learned by doing rather than by watching. Furthermore, students, clinical professors and research became integral parts of a teaching hospital.

While caring for patients the students needed to apply their didactic studies, observe, reflect on real problems, and test hypotheses. Emphasis switched from acquiring textbook knowledge to solving genuine medical problems under the guidance of clinical instructors.

Johns Hopkins was a grand and risky experiment. There was much concern over the viability of the program and over the quality of care in a teaching hospital controlled by academics. Soon, however, it was clear that the quality of care was excellent and that the best physicians in the country were coming from Johns Hopkins. This demonstrated success of clinical instruction provided a model for other schools and soon all leading schools were striving to include clinical instruction.

The idea of giving students practical training in hospitals was an old one, but it had encountered resistance for decades. Hospitals were controlled by practitioners, not academics. Along with the philosophical problems alluded to earlier, practitioners feared that quality of patient care would suffer and that hospital routines would be disrupted. Accordingly, when students were first allowed in hospitals they were given only restricted, observational access. Educators had no control over the student's experience, there was no formal teaching, no access to patients for research purposes, and no control by academics over hospital practice. Academics were convinced that clinical education was desirable, but practitioners were understandably reluctant to turn a major portion of hospital control over to academicians and to let students partake in patient care.

At Johns Hopkins the problems were circumvented by starting the university's own teaching hospital from scratch. Most medical schools, however, had serious financial problems. It was difficult to get proper funding for instructional laboratories, let alone a teaching hospital. Affiliation with existing hospitals was the most reasonable option, but, for the reasons stated above, this accommodation was slow in coming.

It is noteworthy that both fundamental changes, merging with the university and development of clinical instruction, were produced by *educators:* there was no direct involvement of the professional societies or practitioners. Rather, it was the entreprenurial efforts of educators, convincing administrators, politicians, and the private philanthropists to take a chance with a new idea. The role of practitioners and the professional organization came some 15 years later in promoting the new system, selling it to the public, and adopting it as a standard.

The most far-reaching move was when the American Medical Association requested that the Carnegie Foundation survey medical education and report on the condition of medical schools. Abraham Flexner, a progressive educator, was commissioned to visit and evaluate all 155 medical schools in the United States and Canada. The result was the Flexner Report of 1910. Medical schools were rated according to their facilities, admission standards, and the production of original research. Evaluation of facilities included the laboratories, teaching hospital affiliation (if any), and endowments. Many schools were severely criticized, and the schools using the older lecture-only system were condemned outright. Overall, Flexner's report presented a disparaging view of medical education. Very few schools could meet Flexner's ideal of a research oriented faculty with a strong hospital affiliation.

Although often credited with initiating reform, the Flexner Report actually publicized changes in medical education that were already occurring. By increasing public awareness of deficiencies in the old system, the report served as a catalyst to complete the change. Most schools welcomed the report, despite its scathing review, because they had been pointing out the same deficiencies in their programs for some time. It was not any lack of desire among academics to reform; rather, it was a lack of funding and administrative support. The Flexner report, with its powerful language, created widespread public support for reform and a healthy regional competition among the medical schools. Each community and university administration wanted to have, if not the best medical school, then at least one that met Flexner's standards.

Following the Flexner report, the AMA's Council on Medical Education set up a system to rate medical schools on an ongoing basis. The rating was based on evaluation of six major criteria: the entrance requirements, the library and museum facilities, the extent and sequencing of the curriculum, the clinical facility, the number of full-time faculty, and the presence of a research component in the curriculum. Depending on whether or not a school met specific critiera in these six areas, one of three ratings was given: approved, needs improvement, or needs reorganization. The rating system definitely served academicians, and in fact, the Council on Medical Education that rated the schools was made up of academics, not practitioners. The schools that received low ratings used these to demonstrate their needs to the public and to their university administrators. The effect was to help individual schools and to push the educational system toward standardization.

Hospital affiliations also began to increase dramatically, and by 1926 all medical schools in the United States had either acquired a teaching hospital or had ceased operation. The public sentiment following the Flexner Report did much to encourage these hospital affiliations, but there were two additional motivating factors. First, the affiliations were found to be highly beneficial to both the hospital and the university. Sharing of physical plants made excellent economic sense for both. Additional benefits for the hospital were the presence of highly qualified clinical professors on the staff, increased manpower in the form of clinical clerkships and the rapid assimilation of new techniques and research into hospital practice. For academics, the hospital served as an ideal teaching facility and provided opportunities for clinical research. Both the hospital and the university enjoyed the enhanced visibility and prestige of affiliation.

The second additional factor encouraging hospital affiliation was that the tensions between academics and practitioners had begun to ease. Initially these tensions were very high. Practitioners viewed academics as arrogant and unproductive theoreticians who engaged in useless, esoteric research. Academics, in turn, viewed practitioners as unscientific technicians. In the teaching hospitals, however, clinical professors began to bridge this basic philosophical gap. Now there were medical scientists doing applied research whose contributions to medicine could not be denied. Clinical professors, being at home in both worlds, eased the tensions and set the stage for full accommodation. The successes of clinical research hastened cooperation between academics and practitioners and demonstrated the value of clinical education itself.

Maturation of the medical education left academics in control of the educational process, with practitioners in a supportive role. Academics were used to train practitioners and retrain them, in contrast to the apprenticeship system where practitioners trained themselves. In teaching hospitals and through professional associations, practitioners supported the educational system. The benefit was professional advancement, control over the quality of professional practice, and an improved self-image.

Reconsideration of the Forensic Laboratory Sciences

In examining the history of medical education, what might we learn about our present situation in the forensic laboratory sciences? A direct analogy suffers from a number of obvi-

ous shortcomings,[4] but such an analogy is not the purpose here. The purpose is to stimulate creative thinking about alternative educational methods and mechanisms that might result in fundamental change.

There *are* some clear parallels between the current state of forensic science education and medical education in the 1870s.

- The primary burden of professional education is borne outside the university in an apprenticeship system.
- The apprenticeship system is overburdened by a dramatic expansion in the knowledge and skills needed for professional practice.
- There is no standardized curriculum or accreditation process for educational programs.
- There is no educational program that incorporates formal clinical education.

What might we learn from the progress of medical education? Medical education once existed as an ill-defined system, philosophically removed from the university, that did not serve the needs of either practitioners or academics; and yet, in a very short time, the entire *system* was changed. The two fundamental changes were (1) acceptance of professional medical education into the university and (2) the development of clinical instruction.

How Can Change Be Initiated?

The first lesson is in how these changes actually occurred. Both were the result of entrepreneurial efforts of educators; professional societies and practitioners were not directly involved. Individual academicians approached university administrators, foundations, and private individuals for the funding and political support that was required. In the forensic laboratory sciences, we have seen some efforts of this kind. Innovative educational programs in the forensic laboratory sciences have, with some success, been introduced in the past, but they have lacked the institutional support needed for survival. Institutional support will come when the university is convinced (1) that there is a sound academic basis for the educational program, (2) that there is sufficient interest in it to make the program financially feasible, and (3) that the program will contribute in a meaningful, positive way to the university's reputation. Service to the profession and to practicing crime laboratories are perhaps *our* primary goals, but such concerns do not motivate university involvement. It is the task of academicians in the forensic laboratory sciences to create a program that is academically sound and to convince university administrators that professional education in the forensic laboratory sciences can be an attractive addition to the university's professional schools. To be successful the model must also serve the needs of practitioners.

Until we design a meaningful, innovative program that is attractive enough to be academically secure, there is an uncertain future for university education in the forensic laboratory sciences. To date, academics have offered no stable alternative to extended, basic, in-service training [*3*]. We must innovate, sell, and demonstrate the value of the forensic laboratory sciences to the university.

[4]Granted the direct analogy is loose. Most obviously, there is the vast difference in the number of practicing professionals in these two fields. Many other differences exist. Although crime is a serious social issue with broad public interest, it does not have the basic human importance of health care. Health is basically a positive goal, dealing with a universal human need, whereas apprehension, punishment, and civil conflict are unpleasant necessities of a non-ideal society. Furthermore, the relative importance of medical science in the context of health care far exceeds the relative importance of the forensic science laboratory to the justice system. Neither is health care conducted in an adversary setting where rules of procedure and advocacy constrain and often dominate scientific practice.

The Role of Clinical Education and Clinical Professors

The history of medical education also calls our attention to the key role of clinical education in bridging the gap between academia and professional practice.

Formal clinical training requires that meaningful affiliations be established with operational forensic science laboratories. The simple observational or research internship is inadequate, as is a work-study program. There must be a rigorous mechanism whereby students are carefully guided through practical casework by clinical professors. Only in this way can the necessary judgment and critical problem-solving skills be developed. The discontinued program at the University of Pittsburgh, with its extensive practicum exercises, has been the only program to come close to clinical training.

In a more advanced form an operational forensic science laboratory would serve in a manner parallel to a university teaching hospital, with students and clinical professors forming an integral part of the laboratory. If this appears radical, or unworkable, we must remember that an intense controversy once existed regarding the feasibility of clinical training in medicine. There were accommodation problems for medical education, to be sure, and we have our own special problems with evidence control and chain of custody, but these can be surmounted if we approach the problem with an open mind. Recall that between 1910 and 1926 there was a change from very rare and restricted clinical instruction to full clinical clerkships in all medical schools.

> Fears engendered by the presence of medical students in the wards, so common a generation earlier, had virtually disappeared. With the adoption of higher entrance requirements, the average student displayed far more intelligence and better manners than at any time previously. Medical students, given white coats and referred to as "young doctors," came to be accepted in the hospital as a matter of course [5, p. 230].

One major issue that will arise is that of control. Academics will want control over clinical teaching. Practitioners, used to in-house training, will be reluctant to change. But eventually this system must change for the three reasons already discussed: uniformity, efficiency, and stability.

Change will begin when the feasibility and benefits of a teaching forensic science laboratory are demonstrated by a workable model. The model will offer:

- efficient combination of physical plants,
- added personnel resources in the laboratory,
- rapid introduction of research into the laboratory,
- enhanced prestige for both academics and practitioners, and
- relief of the laboratory's in-house training burden.

If this model is to be accepted by practitioners and academics, the positions of clinical professors are critical. The clinical professors command respect in both the academic and professional environments, adapting fundamental research to applied clinical problems. There are a growing number of practitioner-researchers in our profession and among these individuals we will find tomorrow's clinical professors. They will be high-ranking professionals with academic credentials, whom the profession can trust in this critical role.

The Role of Practitioners and Professional Societies

What is the role of practitioners and professional organizations in this process? Fundamentally, of course, practitioners define the educational problem itself. Without practitioners we would have no basis on which to define educational goals or professional needs. The specific, collective role of professionals in relation to education is, however, a much narrower one. Academics must provide the model and control the educational process. Professional

associations then play a key role in standardization and accreditation. The history of medical education suggests that there should be a committee on university education within the American Academy of Forensic Sciences that would determine criteria for educational programs and rate them. The profession would thus serve to accept an educational model and to promote it (as the American Society of Crime Laboratory Directors has done for laboratory accreditation). Academics have nothing to fear from this rating process. It is decidedly in their self-interest to have deficiencies publicly and formally recognized. Recognition will document programmatic needs and help to justify change.

Conclusion

For the future of the forensic science education three major goals have been offered: (1) active entrepreneurial promotion of professional educational programs by academics, (2) creation of a committee within the American Academy of Forensic Sciences to critique and rate university programs, and (3) the development of a well-defined clinical education program.

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