

The History of Medical Education in Europe and the United States, With Respect to Time and Proficiency

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Abstract

In this article, the authors present a historic overview of the development of medical education in the United States and Europe (in particular the Netherlands), as it relates to the issues of time (duration of the course) and proficiency (performance requirements and examinations). This overview is necessarily limited and based largely on post hoc interpretation, as historic data on time frames are not well documented and the issue of competence has only recently been addressed.

During times when there were few, if any, formal regulations, physicians

were primarily “learned gentlemen” in command of few effective practical skills, and the duration of education and the competencies acquired by the end of a course simply did not appear to be issues of any interest to universities or state authorities. Though uniform criteria gradually developed for undergraduate medical education, postgraduate specialty training remained, before accreditation organizations set regulations, at the discretion of individual institutions and medical societies. This resulted in large variability in training time

and acquired competencies between residency programs, which were often judged on the basis of opaque or questionable criteria. Considering the high costs of health care today and the increasing demand for patient safety and educational efficiency, continuing historic models of nonstandardized practices will no longer be feasible. Efforts to constrain, restructure, and individualize training time and licensing tracks to optimize training for safe care, both in the United States and Europe, are needed.

With the introduction of competency-based medical education (CBME), educators and regulatory bodies have recognized the lack of a rationale for the time physicians must be in training to receive a license and start unsupervised practice, and they have suggested allowances for variations in training time, dependent on acquired competence.^{1–5} Training length has been determined historically, and the readiness of residents for practice has been assumed rather than adequately tested.⁶ The nature of the medical degree also has dramatically changed over time and has lost its status in many countries as a license to practice

without supervision.⁷ In this article, we explore the roots of current medical training in Europe and the United States from the perspective of time and proficiency. We chose the Netherlands in particular because academic medicine in that country is representative of that for the whole of Europe and because it was known in Europe for its medical education in the 18th century.⁸

What arguments have been used to arrive at current training lengths, and how have educators and educational programs, across history, allowed for variations in time?

Interpreting the history of medical education in terms of precursors of contemporary developments always entails the risk of constructing an anachronism. For most of history, the question of whether graduating students were “competent to practice medicine” cannot clearly be answered, as the whole concept of “competency” did not exist or existed only implicitly. In the absence of formal skills testing or even any kind of certification, the reputation of a physician was used as a proxy for his competence. Similarly, in the absence of formal curricula or licensing regulations, for many centuries, “variable time” has had a matter-of-fact status; it would not

have occurred to anyone to make training time “fixed” if only because there was no reason to do so. Somewhere along the historical continuum from the Middle Ages until today, however, notions about competency and the fixed duration of medical education emerged, and the purpose of this article is to examine the relevant aspects of the history of medical education to understand current ideas about variable time related to acquired competence.

Medical Education in Europe, 1100–1800

Europe’s formal medical education system started in the late Middle Ages, with the rise of the universities in what is now Northern Italy. From approximately AD 1100 until the mid-19th century, two tiers of medical practitioners existed: (1) academic doctors and (2) practically trained surgeons (which consisted of a motley collection of practitioners, including barber–surgeons, traveling practitioners, ship’s surgeons, tooth extractors, etc.). Academic doctors were learned gentlemen, and their training was exclusively theoretical, except maybe for learning the skill of drug preparation. There was no fixed time schedule for academic medical education: Universities offered programs of lectures rather

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than fixed courses. At Leiden University (established in 1575 in the Netherlands), students took approximately two years of preparatory study, followed by two years of medical study to complete the program. The graduation ceremony consisted of two parts: a doctoral examination, in which the theoretical knowledge of the candidate was assessed; followed by a public ceremony in which the candidate had to defend theorems, often based on the works of Hippocrates or Galen. In the 18th century, it became increasingly more common to defend a (small) dissertation, which was a report of a study performed by the candidate.

By 1815, it became mandatory to prepare this type of dissertation to acquire the degree of medical doctor, though the candidate was still required to defend 12 theorems.^{9,10} There were no other examinations, for the pressure of examinations was felt to be in conflict with the academic concepts of freedom to learn and teach and the role of professors as educators, rather than teachers.^{11,12} The absence of any specific performance requirements or learning objectives and the emphasis on students' enculturation were the hallmarks of academic education (until the early 19th century), which fits the description of medical education as "tea steeping."¹³ To become a learned gentleman (the essence of an academic physician), students just had to spend time in an academic context. Many students attended lectures for a while, and then left the university without graduating. Academic certificates were mostly useful for students who wanted to go abroad and needed evidence of their education; in general, few professions required their practitioners to possess academic diplomas at all.

The training of second-tier surgeons was predominantly practical, with variable levels of academic training, although some programs were rigorous, using master surgeons to supervise apprenticeships and provide theoretical lessons. In the Amsterdam Guild of Surgeons, for example, the training lasted five years and concluded with an examination for which the apprentice had to construct lancets and demonstrate the skills of bloodletting and skull trepanation.¹⁴ To be admitted to the practical examination, the candidate first had to pass a theoretical examination, similar to the academic physician: In

Leiden, the candidate surgeon was interrogated about several theses in front of a board (including an academic professor, the dean of the guild, and two master surgeons).

The guilds were professional trusts that served the interests of the associated craftsmen, rather than educational organizations; as such, apprenticeship time as well as examination requirements varied considerably. Economic and practical concerns outweighed educational requirements. In terms of competencies, advanced apprentices who wanted to become full members of the guild had to pass a much more demanding examination than academic physicians. In contrast to common beliefs, surgeons were aware of the limits of their craftsmanship; most activities concerned relatively safe external treatments (e.g., setting fractures, bandaging, and administering ointments). Major surgical operations, such as amputations, lithotomies, and removing tumors, were performed almost exclusively by master surgeons, who were willing to take risks other physicians avoided.¹⁵

Medical Education in Europe, 1800–1950

In the first half of the 19th century, the medical education system gradually but profoundly changed. The French Revolution led to the dissolution of the guilds, and medical education, with a few exceptions, became an exclusively academic affair. Quality control of physician education was taken over by state authorities, whose primary aim was to ensure and improve public health rather than to serve the interests of physicians. In the Netherlands, for example, an 1815 decree established the structure of the academic medical curriculum and listed the disciplines to be included,¹⁶ but nothing was stipulated about their content, which was determined by individual professors, being both teacher and examiner.

The ideal of educating and cultivating students to become learned gentlemen remained a leading principle. No practical clinical courses were required, and the academic degree was both necessary and sufficient to practice medicine. Preparing students for medical practice was not considered an academic responsibility until well into

the 20th century.¹⁷ Preparing students for scientific medicine, on the other hand, became increasingly more important, and scientific skills, such as observation,¹⁸ were emphasized in curricula more and more. Gradually, academic disciplines, such as psychology, psychiatry, and social medicine, were introduced as substitutes for practical training, but they remained without real patient contact.¹⁹ Medical faculties were happy to leave practical training to hospitals and family physicians during clerkships.

New legislation in the Netherlands in 1865 required students to pass a state-controlled, practical examination to practice. This introduced the idea of competence into Dutch medical education. Performing a physical examination and demonstrating certain minor surgical procedures became part of licensing examinations.²⁰ As the authorities were not interested in how and where the student acquired his (or her) knowledge and skills, there were, in principle, no fixed time requirements, either for academic studies or for preparation for the practical state examination.^{21,22}

In short, time variability in Dutch medical education from 1865 to 1965 was largely a consequence of a lack of strict academic regulations. For example, because there were few mandatory courses and the preclinical curriculum until the 1920s was only partially graded, students were allowed great latitude in advancing through the curriculum at their own speed. Students who were on a tight budget took advantage of this latitude to accelerate through their courses, with anecdotal reports about students fulfilling the requirements of their second and third years in the time span of one year.²³ However, these students were exceptions,²⁴ and Abraham Flexner,²⁵ who visited Dutch medical schools in the 1920s, noted that students were expected to attend the same lectures, with no opportunity for electives, and hence he concluded that "individuality [did] not disclose itself."

On the other hand, time variability worked mostly in the opposite direction of accelerated advancement. Particularly harmful was students' freedom to endlessly repeat examinations if they failed. Together with decades of continuous expansion of the content

of the medical curriculum, it took the median medical student in the late 1950s and early 1960s about 8.5 years to graduate, and approximately 30% never did.^{26–30} Compared with the first decades of the 20th century, this represented an increase of 1.5 years for the average student.³¹ Lagging behind became endemic because the curricular load, but not the formal curricular length, increased considerably over the years.³²

The practical state examinations, introduced in 1865 to guarantee graduates' competence, turned out to be logistically demanding and, by 1960, involved little more than compiling a collection of certificates of completed mandatory clerkships. This situation has essentially not changed—Dutch undergraduate medical education still has no national exams. For a long time, clerkships lacked clear educational objectives and examinations, and they were based on a fixed-time principle: Students “served their time” in a system that was described as “jumping from one clinic to the other.”³³ Faculty showed little interest in what happened during clerkships, and students were often mere spectators. Hands-on experience was usually “scut work”: patient intakes or routine laboratory tests. In this respect, the Dutch and German medical education systems were similar,²⁵ but they differed sharply from the British and French systems, in which practical clinical education was more prominent.³⁴ Nonetheless, in the United Kingdom, the explicit aim of medical education until 1968 was to produce a “graduate fit to practice medicine independently directly upon leaving medical school.”³⁵ As practical training was deficient, medical faculties could only maintain claims about graduates' ability to independently practice medicine by submitting to “coveritis,” the belief that every topic of importance must be covered by the curriculum, at least in theoretical courses, at the expense of in-depth study and electives.³⁶ Coveritis was the natural successor of the 19th-century notion of *omnibus aliquid* (“a little bit of everything”).³⁷

The Development of Medical Education in the United States

Medical education in the United States did not originate at universities, nor was it regulated by guilds. It has always had

more process and outcome variability than European medical education. Though some medical schools and faculties existed (e.g., Medical College of the University of Pennsylvania established in 1766), the predominant format of U.S. medical education through the middle of the 19th century was an extended apprenticeship.^{15,38} Coverage of theoretical material was weak; most teachers provided few current textbooks and quizzed students on an irregular basis. Proprietary (for-profit) schools, “with requirements as lax as their curricula were brief,” proliferated in the first two-thirds of the 19th century.³⁹ Timewise, the length of the average medical curriculum in the British colonies in North America and later in the United States, whether apprenticeship based or institutional, steadily increased from the 17th until the 20th century (until 1810, the United States had but three medical schools).⁴⁰ At the end of the 19th century, the best medical schools prescribed a three-year curriculum, but most schools still had only two years.⁴¹ The differences in outcomes were even larger because the better schools also had more demanding admissions requirements.

Students, on the other hand, flocked to the medical schools that offered degrees in the shortest period of time.⁴² In 1847, a precursor of the American Medical Association (AMA) recommended that the academic term be standardized to six months and that graduates be required to take two courses of lectures and present evidence of an apprenticeship with a qualified preceptor. But these were only recommendations, and until the 20th century, it was possible to graduate from medical school without ever setting foot in a hospital.⁴²

Until the late 19th century, state governments were not interested in the content or length of medical education.¹⁵ William Osler (1849–1919) was the first to establish structured postgraduate residency training at Johns Hopkins Hospital. An important feature of this model was its pyramidal structure: many interns, fewer residents, and at the top a single chief resident, who could remain for up to seven or eight years. Increasingly, a teaching hospital's medical staff consisted of doctors in training. The AMA did not establish educational standards for internship programs until 1919, which could vary in length. In the

mid-1930s, most were 12 months, one-fourth were 24 months, and a few were 36 months.¹⁵

Harvard graduate Lewis Thomas,⁴³ whose book *The Youngest Science* (1983) includes an autobiography of his professional life, fulfilled an 18-month internship (1937–1938). About his internship, he wrote:

One rose through the hierarchy automatically, but the jumps from one rank to the next seemed quantum leaps. The newest man was the Junior, ... known as the “pup”; ... life was spent collecting specimens of blood, urine, faeces, spinal fluid, sputum, ... pleural fluid, and doing the laboratory diagnostic work—all the work for his assigned wards of thirty patients....⁴³

The second period (nine months) of his internship “contained the reward for the first nine: the privilege of giving ... orders instead of taking them.” The last three months, he wrote, the intern spent at the top of the hierarchy in the role of house physician; “one became House automatically after fifteen months of duty.” There was no examination, and one could not fail the internship (except through accidents, diseases, or other personal circumstances). In Thomas's internship, competency testing was implicit: “[I]f your lobar pneumonia cases were well handled, you were likely to have a future; if not, not.”⁴³ Again, the intern did not earn a grade, but he (or she) could earn a reputation (or lose it) during this time.

Osler's postgraduate training model gradually spread around the country and internationally. As it became increasingly common for medical graduates to go on to postgraduate training, this system became the standard after World War II. A rotating internship provided a badly needed year of general training, enabling graduates to mature as physicians, gain breadth in perspective, and choose a specialty. This year was abandoned in the United States around 1970, depriving newly graduated doctors from acquiring additional experience before deciding on which residency to pursue.¹⁵

Undergraduate Medical Education in Europe and the United States After 1950

During the 1950s and 1960s, dissatisfaction with the medical

curriculum increased in Europe and the United States. Curricular overload was rampant and prevented all efforts to make the course more practical. The problem of the lock-step curriculum,⁴⁴ almost devoid of any electives and with a lack of opportunity for individual expression, already noticed by Flexner,^{25,45} increasingly conflicted with commonsense beliefs about good education. “The Procrustean treatment of medical training in the bed of time” which delivered “an individual with a punched four-year time-card”⁴⁶ could no longer be defended. Or, as Jason¹ put it,

[t]he consequence of our administratively determined but artificial situation that, . . . ten weeks will be allocated for biochemistry and . . . fifteen weeks will be allocated for surgery, creates a situation where students leave the sub-parts of our programs and the total professional program itself with a very wide range of deficiencies as well as competencies. . . . By making time a constant, we make achievement a variable. The most mature educational programs, toward which we should be aiming, specify objectives sufficiently clearly so that achievement can be made a constant, which in turn requires that time be made a variable.

The goal of making achievement a constant implies that vague claims about graduates “being fit to practice” are no longer acceptable. Rather, a detailed analysis of the characteristics and qualifications of the modern physician was deemed necessary, in terms of skills, personality traits, social and economic problems, and responsibility as a citizen.⁴⁴ In the decades that followed, more concrete educational objectives were specified by leading medical faculties, which also established educational departments that applied modern psychological measurement techniques to student assessment. Gradually, competencies as a standard against which recently graduated physicians could be assessed replaced the earlier belief that a student could graduate just by fulfilling a predetermined number of weeks or years in training.¹ However, to “specify objectives sufficiently clearly” is easier said than done, and the discussion on how to achieve this clarity continues today with the CBME movement.⁴⁷

From a broader perspective, the length of the medical curriculum has steadily increased over time. After the “Flexnerian revolution,” undergraduate medical

education in the United States remained approximately the same in duration, but increasing entrance requirements moved much of premedical and basic sciences to the preparatory years. In 1942, when the Liaison Committee on Medical Education was created, national control of the quality and regulation of undergraduate medical education gradually came to life.

In Europe, efficiency was gained by restructuring and tightening the curriculum. This gain came at the expense of students’ academic freedom. Modern curricula became integrated, centrally coordinated, more problem based, and more vertically integrated—that is, with early clinical experience gradually building up the responsibilities of medical students in patient care,⁴⁸ but with a fixed length, largely determined by European Union rules.⁴⁹

Postgraduate Medical Education in Europe and the United States After 1950

While Osler’s postgraduate training programs were highly selective and recruited small numbers of scientifically oriented graduates, halfway through the 20th century, any U.S. medical school graduate became eligible to continue with postgraduate training. Internships, previously of varying length and rotational content, became the first year of specialty training. To address tensions in the specialty choice market, the U.S. National Intern Matching Program was created in 1951 to regulate placements based on graduates’ and hospitals’ preferences.⁵⁰ While the duration of postgraduate education historically was somewhat arbitrary, being regarded as workforce training and individual maturation combined, it now became more regulated. The creation of subspecialty training led to a reduction in generalist training time—for example, almost halving the total training time in general internal medicine in the 1970s, with similar trends in other disciplines. A purpose of this reduction was also to produce more generalists—that is, a shorter training time would make general internal medicine more attractive.¹⁵ Specialty associations, governing bodies (e.g., medical colleges), councils, accrediting bodies, and ultimately legislators all used their powers to influence the length of postgraduate education to best serve their own interests.

Only in the 1980s, when the Accreditation Council for Graduate Medical Education (ACGME) was established, did postgraduate medical education in United States start to be governed by a powerful national body determining length, content, and qualifications. The ACGME, along with the Royal College of Physicians and Surgeons of Canada, initiated the movement of competency-based (postgraduate) medical education around the turn of the 21st century, bringing time variability in clinical training to the attention of the field.³ In 2000, Long⁵¹ suggested that educators “replace the current approach to residents’ education, which specifies a fixed number of years in training, with competency-based training, in which each resident remains in training until he or she has been shown to have the required knowledge and skills and can apply them independently,” which was echoed by Carraccio, ten Cate, and others.^{3,4,52,53}

When the ACGME restricted resident duty hours in 2003, then again in 2011, to no more than 80 hours per week,⁵⁴ several programs, in particular those in the surgical specialties, lamented the decreasing availability of residents and raised concerns that time in training was now insufficient to produce good surgeons. A recent comparative study in the United States showed little evidence of differences between a standard regime of surgical training and a flexible-policy regime featuring different shift lengths, with regard to patient mortality and complications, satisfaction with overall educational quality, and fatigue and well-being.⁵⁵ Trainees in the more flexible regime did report a favorable impact on patient safety, continuity of care, professionalism, and attendance at educational meetings but an unfavorable impact on personal activities.⁵⁵ An international comparative study on surgical training outcomes did not reveal substantial differences despite duty hours differences.⁵⁶ The debate about duty hours among residents and flexibility in applying duty hours restrictions in programs will likely remain vital in the coming years.

In Europe, the aim of establishing an international market for professionals resulted in a 1975 European Union directive determining the minimum length and nomenclature of postgraduate medical education programs,^{57,58} but it did not specify the required competencies

of practitioners. In fact, European postgraduate training largely escaped efforts to reduce its length and, despite attempts by the European Union of Medical Specialists to set standards, content and requirements of training may vastly differ.^{59,60} In the Netherlands, following the CBME movement,⁶¹ individual time variability has been more rule than exception, if only because of varying moments of graduation from medical school and commencement of residency across the academic year and the habit of medical graduates to take time between undergraduate and postgraduate training.⁶² Recently, however, in an attempt to reduce the overall cost of health care, the Dutch government, which pays most of the costs of postgraduate medical training, decided to force programs to reduce training length to closer to European Union minimum durations. This caused the Federation of Medical Specialists to implement individualized, competency-based variability using the concept of entrustable professional activities⁴ rather than to generally cut time in training.⁶³

Conclusion

Medical training, from the medieval guilds to today's residencies, has always experienced a tension between academic and practical approaches. In Europe, until well into the 19th century, there was a sharp distinction between academically trained "learned gentlemen" and practically trained surgeons. In the end, academic medicine succeeded in abolishing the "second tier" surgeon practitioners, but at a cost. Whereas the importance of practical skills increased, universities largely refused to consider training students in these skills to be part of their mandate. The content of clinical training was long left to hospitals that had a primary aim of patient care rather than education.

In the United States, where medical education initially was predominantly provided by stand-alone medical schools, the AMA developed formal regulations for residency but still had limited influence on what actually happened in the hospitals. Such a context in which patient care has high priority and the content of training is left to an institution's discretion is not conducive to the close monitoring of trainees to determine when they meet set standards.

In such circumstances, a competency-based, flexible-time approach may not easily work. For that reason, a minimum time span for training (e.g., "three years' experience in general internal medicine") has served as a proxy for "being competent." In addition, the increased complexity of medical practice, both from a technical point of view and in terms of an on-average sicker patient population, shorter hospital stays, and the economic pressure of managed patient care, has generally added to the length of training time through subspecialization, without optimal guidance on developing competence. These developments have resulted in our current system, in which efforts are needed to constrain, restructure, and individualize training time and licensing tracks to optimize training for safe care, both in the United States and the Netherlands.

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