

THE EDUCATION OF A SURGEON: PAST AND PRESENT

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THE dominant objective of this great surgical organization is to direct the training of the surgeons of America, so that there shall be an adequate number for the various sections of the country, and these so prepared as to make them safe from the standpoint of the public. The achievement of this purpose involves the solving of many problems, among which are premedical training, general medical education, postgraduate study including specialization, and, finally, the limitation of the practice of surgery to those who are properly and fully qualified. Let us call upon the lessons of the past to help us in our proposals for the future. Let us in particular review the methods by which these problems, especially specialization and the qualification of surgeons, have been met under other conditions.

"Surgery is as old as human needs." Can one imagine a time when no effort was made to arrest hemorrhage, remove a foreign body, or immobilize a fracture? We know that the early inhabitants of this continent made use of trephining. Three to four centuries prior to the Christian era the Hindus, in an advanced state of civilization, practiced surgery on a highly developed and idealistic scale. It cannot be claimed, however, that present day technical surgery has been influenced by the distant past, because the introduction of anesthesia, and the knowledge of bacterial influences, quickly changed a limited craft into a vast science. On the other hand, the rating of surgery in the public mind, the standards of surgical education, the position of the surgeon in the community, have always been subject to change and vicissitude. To understand present conditions we must survey the road over which surgery has traveled.

An historical review shows great waves during which surgery and the surgeon were alternately held in high esteem and despised. These swings, like great pulse beats, are in part explainable. The practice of medicine and surgery has always been affected by the prevailing intellectual, scientific, and philosophical standards of the time, as well as by the habits and customs of a people. The Alexandrian schools, fostered by a practical, military, urban people were highly

organized and surgery was surprisingly developed with emphasis placed upon anatomy, the employment of mandragora as an anesthetic, and the use of ligatures for the control of bleeding. Physicians and surgeons occupied an exalted position in the public mind. They held a similar position during the days of Greek predominance. But, after the Romans conquered the Greeks and Macedonians, philosophical and scientific thought languished and medical progress and standards correspondingly deteriorated. Their physicians, who were at first Greeks, were honored for a time but were later treated with contempt. Nevertheless inasmuch as the Romans were a military people, surgery was recognized as essential and it was relatively advanced. There were, however, no schools, and individual instruction was the rule. The period of study varied: Galen spent 11 years in preparation; on the other hand, Thessalus taught anyone to become a physician in 6 months. Unfortunately, records of these early times are meager. What would we not give to have details concerning the treatment of Crassus, the eminent Roman orator, who died of pneumonia or pleurisy? What would we not give to picture more clearly the successful extraction of a barbed arrowhead from the intrathoracic wound of Alexander the Great? In this connection let me emphasize the importance of the complete and permanent records which are now part of every hospital.

In the light of the modern tendency toward narrowing specialization, Celsus, a Roman author of the first century, stands out as an example. He evidenced a broad, non-specialized training, for he wrote with authority on farming, law, military tactics, philosophy, and medicine, his surgical discussions being particularly notable. We must commend as worthy of thought by the present day educator, the broad training and interests which this man possessed.

The dissolution of the Roman Empire arrested all scientific and medical progress. Under the barbarian hordes, medicine reverted to primitive levels. Among the German and other tribes, the monks became the healers; herbs were accepted as having therapeutic properties by reason of the belief that God or nature provided a remedy for every ailment; it was for man to find the remedy. Even among the more civilized peoples there was

a decline in scientific thought. The rise of Christianity tended to turn attention from the mundane to the supernatural. As a result, sickness was generally regarded as a punishment, not as a natural phenomenon. The priest became physician, and sickness was to be escaped, if at all, only by prayer. Thus medicine, and particularly surgery, reached their lowest ebb.

The Arabs lifted medicine out of this abject state and gave the initial impulse to the development of modern medical education. Their influence steadily increased from the sixth to the tenth centuries, i.e., from Mohammed almost to the time of the capture of Bagdad by the Mongols, when Arab culture suddenly ended. The Arabs had hospitals and schools of a high order with special departments for different diseases. Candidates were required to pass examinations in order to practice medicine. Damascus, that "paradise of the earth" and "pearl of the Orient," became the dominating center of medical education. But the services of the Arabs to surgery were insignificant, first, because their religion forbade dissection, and second, because it was characteristic of the race to accept suffering with equanimity and to be unconcerned about its alleviation. The surgeon was rated on a low scale, almost as a lackey. Although the Arabs made original contributions to medical knowledge, their greatest accomplishment was the translation of the works of leading Greek philosophers and physicians, thus rendering available the knowledge of the past—the bequest of the ancient world. According to Neuburger, "The Arabs possessed far more of Galen's anatomical works than have come down to us; the great gaps in the original books have only been filled by means of the Arabic translations."

The medical standards and contributions of the Arabs left a mark in Italy, where, on the decline of Arabian culture, the foundations of modern medical education and surgery were laid. There, during the thirteenth century, medical education was systematized and anatomical knowledge was greatly extended. This progress was followed by serious and scientific physiological studies. To systematize medical instruction and requirements, Emperor Frederick II ordained that no man should be admitted to the study of medicine before he had studied logic for 3 years. We see in this an early appreciation of an intensive intellectual training prior to specialization. The study of medicine required 5 years. Then an examination was held, followed by an apprenticeship of 1 year. How similar to our modern system is this, namely, 3 years of premedical training, 5

years of medical school, and 1 year of practical instruction, comparable to our internship. Notable steps were also taken to restrict the practice of surgery in order to safeguard the public. By the regulations of Frederick II, no one was permitted to practice surgery until he had shown by written testimonials of the teachers of the Medical Faculty that he had studied for at least 1 year such branches of medicine as would qualify him to do surgery. This comprised human anatomy and knowledge of surgical operations and surgical treatment.

Thus, in the thirteenth century, the laws made it impossible for any one not thoroughly trained to practice medicine, "at least in the more populous districts," showing an early recognition of the difference between rural and urban communities. The restrictions were due to an educated public opinion and to pressure from without. Let us hope that we ourselves will voluntarily make readjustments in the practice of medicine and surgery as changing social conditions and standards of living indicate and that we will not allow these changes to be determined by legislation or other outside influences. The regulations of Emperor Frederick were widely adopted by later institutions, such as the Salerno and Montpellier schools.

At this time progress was based chiefly upon anatomical studies. In the first part of the Middle Ages, human dissection was not only forbidden by law but was also restricted by religious prejudice. The study of anatomy, therefore, consisted for the most part in animal dissection. Dissection of human cadavers was not generally introduced until the sixteenth century. In the beginning the professor from a pulpit described the parts, the dissection being performed by a surgeon or barber. The manner in which such anatomical instruction was presented is illustrated in several paintings of the Dutch school. But the Italian anatomists themselves performed the dissections. Thus they acquired a more vital and intimate knowledge and we find that virtually all the prominent anatomists of the time received their education in Italy.

Considerable attention was devoted to the study of the circulation, notably by Realdo Colombo, successor to Vesalius in the chair of anatomy at Padua. When Vesalius, in 1542, went to Basle to further the printing of his monumental anatomical work, Colombo was appointed his successor. It is said that he dissected about 14 cadavers annually and that he was the first to use dogs for vivisection. His most notable contribution was a description of the lesser circula-

tion. It is a question, however, whether the credit for this should not be given to Servetus who would then become the real forerunner of William Harvey. Padua in the sixteenth century had conspicuous surgeons as teachers, notably d'Aquapendente, a pupil of the anatomist Fallopius whom he succeeded (1565) as instructor in anatomy. He built at his own expense a large anatomical theater where he held forth to huge gatherings of students from all countries. We see here a great scholar, a great personality, swaying and impressing an attentive mass of young men. Has not this something to commend it? Do we not discount today the influence which might be exerted upon the young man by outstanding personalities in the profession who might well be introduced to him in the amphitheater? Surgery as practiced in Italy at this period was presented by Giovanni Antonio Della Cruce of Padua in a classical textbook, published in 1573, which was a standard work for more than two centuries. In it trephining is extensively discussed; the text is accompanied by illustrations of the instruments employed for the operation, many of which are almost identical with those used today.

Beginning with the middle of the fifteenth century, students from all over the world went to Italy, especially to Padua and Bologna, just as a few decades ago we went to Vienna, Edinburgh, and Berlin. And what extraordinary products resulted from such migrations! Among those who were influenced by the Italian schools, for it is always a stimulus to dwell upon the great men of the past, may be mentioned Linacre who graduated in medicine from Padua. Afterward he introduced the medical sciences into England where he became physician to Henry VIII. He left a fortune to establish the Royal College of Physicians in London, 1518. Caius, who also studied in Padua, advanced the study of anatomy in England. He obtained annually from the authorities the bodies of two executed criminals for dissection. He was court physician to Queen Mary and Queen Elizabeth. William Harvey, immortalized through his discovery of the circulation of the blood, matriculated at Padua in 1598 and received his diploma in 1602. He became court physician to James I and Charles I.

During this period of Italian predominance, France was also progressing. In the thirteenth century there occurred a development which may be regarded as the precursor of modern surgical societies and colleges. This was the organization of the Collège de St. Côme by the surgeons of Paris. Regular meetings were held for the discussion of professional and educational subjects

and students were instructed. Later, as a result of the influence of such men as Lanfranchi and Guy de Chauliac, the French became the leaders in surgery, a position which they held until the middle of the nineteenth century. The pupils of the Collège de St. Côme acquired a scientific education equal to that of the physicians, but socially they were regarded as inferior. The dispute between physicians and surgeons lasted until the beginning of the eighteenth century. It is said of John Hunter that "more than any man, he helped make us gentlemen."

About the seventeenth century modern scientific methods of thought and medical education may be said to have taken root. Francis Bacon wrote: "Medicine is a science which has been hitherto more professed than labored and yet more labored than advanced: the labors spent on it having been rather in a circle than in progression."

He criticized specifically the scant progress in the treatment of disease and in the prolongation of life. An outstanding indication in his analysis of medicine may be given in his words: "That utility may be considered as well as humanity, the anatomy of the living subject is not to be relinquished—since it may be well discharged by the dissection of beasts alive." Bacon forecast the importance of pathological anatomy.

The development of scientific thought and inductive reasoning was destined to control and minimize superstition and reliance upon the supernatural, which had always interfered with medical progress. The people had never recognized medicine as a progressive science. Their faith for centuries had lain in "healers" of one kind or another—witches, medicine men, and the spirits of departed saints. For instance, in 1562, Don Carlos, Prince of Spain, suffered from erysipelas. The King and Vesalius were summoned. When the patient's recovery seemed hopeless, the relics of St. Diego, whose body had been brought in with great solemnity, were placed by the Prince's side and improvement immediately set in.

During the seventeenth century medical education became greatly broadened. Previously it had been based upon theoretical lectures by leading authorities. Gradually the sciences, chemistry and physics, were included; greater emphasis was placed upon anatomy through dissection, clinical instruction was given in hospitals and, finally, independent work was encouraged. Yet it is astonishing how slowly practical instruction developed, since its value was recognized years before it was generally adopted. Bedside teaching was encouraged by the Medical

Faculty of Paris as early as 1449. However, the University of Leyden appears to have been the first to establish permanent clinical instruction; this was about 1630. The student took a history, made a physical examination, and registered his diagnosis; then the professor confirmed or refuted it. Boerhaave, who later became head of the University of Leyden, should be remembered for his efforts to develop this feature, which is the basis of our modern bedside teaching.

Early American medicine was dependent upon the developments which we have attempted to describe. John Morgan, after spending 5 years in Europe, became imbued with the importance of organized medical training with which he had become familiar abroad and, on his return, delivered his famous "Discourse upon the Institution of Medical Schools in America" (1765). As a result of his influence a medical school was founded in Philadelphia, the first in this country. Foreign influences were likewise responsible for the founding, some years later, of the College of Physicians and Surgeons in New York.

The details of the subsequent development of medical education in America need not be reviewed. Initially, the profession was composed of serious-minded men of culture; but gradually social climbers, quacks, and charlatans became more and more numerous. There sprang up innumerable commercial institutions and third-rate schools which issued a degree for a few dollars after a few months of instruction. We may look with pride on the fact that as a result of the efforts of the medical profession during the last 50 years, we have gradually worked back to high standards; I am tempted to say, to the same relative standards that prevailed in the thirteenth century under Frederick II. The profession no longer needs to struggle for existence. People are so convinced of the efficacy of medicine and surgery that miracles are expected from the doctor, not from the faith healer. Formerly, a cure by surgery was greeted with prayerful gratitude and amazement; now it is taken for granted, and failure to effect a cure is a cause of surprise. But the millennium has not been reached. We must admit that defects in our system still exist and we must ever earnestly strive toward their correction.

Let us summarize present day problems, some of which are unique. The field of surgery has been enormously extended, so that "no part of the human anatomy is immune from the surgeon's scalpel." But into this wide field have been injected risks of misapplication. The practitioner

of medicine now holds a high place in the social scale, and the surgeon is more highly esteemed than at any time in history. It is not surprising, therefore, that this social and economic factor influences young men in their selection of medicine as a career. Yet, the controlling impulse is, for the most part, humanitarian. To foster this idealism in the young and to effect the best results, a broad general education rather than premature specialization should be the aim. The premedical requirements are too highly specialized and need revision. My reasons for this statement as well as for other criticisms of our modern system of medical education, have been outlined in a recent address and need not be repeated here.

Undergraduate medical education has been well organized and standardized. It supplies an adequate number of trained men for the care of the sick and the prevention of disease. The student is taught to think and reason rather than to memorize as of old. Perhaps undue weight is being put upon research as an objective. Research should be inspired by an irresistible search for truth, and should not, as is so often done, be undertaken for self-exploitation.

With the completion of the undergraduate course, i.e., the attainment of a medical degree, certain factors in the present system for further training give rise to just criticisms. Almost all graduates take an internship. But we must face the fact that no interne system has proved wholly satisfactory. I believe that this is one of the most important subjects for study and readjustment. Under the average resident system, the interne wastes much of his time; under the old-fashioned and usual system, the interne gets more opportunity than he can digest, and at the expense of others who could properly profit thereby. Under both systems there is too early specialization. Every surgical aspirant should have at least one preliminary year on a general medical service and should at some time receive instruction and experience in the psychiatric aspects of general hospital practice—two features which are ordinarily neglected.

There is perhaps a growing tendency to slight pathology and physiology throughout all the developmental years. The laboratories of a hospital should be so laid down and administered as to attract the clinician on his daily rounds. Intimate contacts between clinicians and laboratory workers should be encouraged. Without such a close union and atmosphere the scientific progress in an institution will quickly wane.

The young man who is ready to embark on practice finds the field of medicine overcrowded,

and particularly so the field of surgery. This condition is most marked in the densely populated areas; therefore, efforts should be more active to induce recent graduates to enter country districts.

The enormous development of the knowledge of disease and the technical details of treatment have made specialization necessary, but it has been overdone. Measures are indicated to require of every specialist a broad general preliminary training.

We all favor extension of studies beyond prescribed internships, but the expense prevents many promising candidates from pursuing such a course. Fellowships should, therefore, be more generally available, and greater efforts should be made to obtain endowments for this purpose.

A Goettingen physician in 1420 left 600 florins, the interest to support a poor medical student for 4 years in Montpellier. Although this was an act of benevolence, I cannot but feel that it is the graduate or fellow rather than the undergraduate for whom funds should be made available. It were better to make the men who are already in medicine as useful as possible rather than to tempt others into an already overcrowded profession.

While present day surgery is, in general, on a high standard, there is some commercialism, evidenced by excessive charges, too radical and unnecessary surgery, and fee splitting. The public and the profession are frowning more and more upon such practices, and idealism and altruism are becoming increasingly the dominating motives. If conditions are to be fundamentally improved, the young must be influenced. This is difficult under our present educational system. The obligation is a heavy one; it is one which must be borne chiefly by the teachers in our medical schools.

The weakest and least developed feature in medical education is postgraduate surgery. It is impossible under present conditions to provide operative instruction. Only extensive practical experience can qualify a man to operate with safety to the patient. Theoretical postgraduate courses which include the viewing of, and even the assisting at, operations give a man a degree of self-confidence which is dangerous. In the early days of American medicine, operative clinics were mainly utilized for surgical instruction. They were widely attended and were often spectacular affairs. In visiting operative clinics I have often been impressed by the fact that they are relatively useless for purposes of instruction, and that from a humanitarian point of view, as

Cushing has pointed out, they are ill-advised. "Operations," says Flexner, "are performed in large amphitheaters in which the surgeon and his assistants surround the patient, to whom they give their whole mind, in practical disregard of the students, who loll in their seats without an inkling of what is happening below. Most of the students see only the patient's feet and the surgeon's head."

But graduate training in surgery must be provided. There should be a carefully directed and supervised apprenticeship, in which the graduate actually participates in practical surgical work. Such a graduate course should not be merely a classroom, operating room, and laboratory function, and it should not be confused with postgraduate study, i.e., the further pursuit of an already acquired specialty. Whenever possible it should embrace continued study of the basic medical sciences, such as anatomy, physiology and pathology, and the auxiliary clinical branches, such as radiology. The great teaching centers and medical schools are inadequate for this purpose.

There are, however, almost unlimited facilities in the non-academic hospitals throughout the country. These should be organized and used for the purpose, a feature which is well within the province of this College. The present form of internship is wasteful and should be modified so that the material will be shared between internes and other graduate students, such as fellows. The latter should be accepted for a relatively long period and should be allowed to operate under instruction and supervision. The character of their work and their personalities should be carefully weighed in the decision as to their qualifications as surgeons.

The public must be protected from the incompetent and casual operator. Before embarking on a surgical career, a man should be required to have something more than a medical degree. A certification or registration based upon training, character, and ability should be obligatory. The qualifying and examination of a candidate should be the function of the profession. We may feel encouraged by the fact that much progress in this direction has already been made and we may justly anticipate an era in the near future when this ideal will be attained. But we must continue to work diligently toward one end, remembering the words of the poet:

Ye rigid Ploughman! Bear in mind
Your labor is for future hours.
Advance! spare not! nor look behind!
Plow deep and straight with all your powers

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