Evolving Educational Techniques in Surgical Training

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KEYWORDS

• Surgical education • Training • Innovations • Educational techniques
• Medical student • Resident • Surgeon

KEY POINTS

- Surgical education has undergone a tremendous transformation since its advent in the early twentieth century, transitioning from an "apprenticeship" and "journeymanship" toward a training model based on knowledge of basic sciences, research, and graduated patient responsibility for the resident.
- Training competent and professional surgeons efficiently and effectively requires innovation and modernization of educational methods, with recognition that surgical classroom is under constant transformation, and an understanding of today's learner and learning styles.
- E-learning and the use of online curricula allows educators to overcome obstacles related to surgical education with increased accessibility of learning material, ease in updating and editing content, personalized instruction, simplicity of distribution, standardization of content, and learner accountability.
- Today's medical learner is using multiple platforms to gain information, including online surgical resources, videos, social media, and podcasts, providing surgical educators with numerous innovative avenues to promote learning.
- With the growth of technology, and the restriction of work hours in surgical education, there has been an increase in use of simulation, including virtual reality, robotics, telemedicine, and gaming. The use of simulation has shifted the learning of basic surgical skills to the laboratory, reserving limited time in the operating room for the acquisition of complex surgical skills.

INTRODUCTION

Surgical education has undergone a tremendous transformation since its advent under William S. Halsted, MD, in the early 20th century, transitioning from an "apprenticeship" and "journeymanship" toward a training model based on knowledge of

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basic sciences, research, and graduated patient responsibility for the resident. Training competent and professional surgeons efficiently and effectively requires innovation and modernization of educational methods, recognition that surgical classroom is under constant transformation, and an understanding of today's learner and learning styles. To understand today's educational climate, one must first examine the history of surgical education.

HISTORY

Study the past if you would define the future.[1]
—Confucius

In the early twentieth century, William Welch, the founding dean at Johns Hopkins; William Osler, Hopkins' first chief of medicine; Frederick Gates, a Baptist minister and trusted adviser to John D. Rockefeller; and Abraham Flexner, a former high school teacher, gathered as the "Hopkins Circle" and forever altered the course of medical education in the United States by advancing the science-based foundation of medical training. Flexner was invited to survey the quality of medical schools throughout America and Canada and provide suggestions for their improvement. Specifically, his assignment was to "sweep clean the medical system of substandard medical schools that were flooding the nation with poorly trained physicians."[2] Flexner's 1910 report on the state of medical education was historic, not only for its comprehensive review of all 155 medical and osteopathic institutions in the United States and Canada but because of its impact on the manner in which medicine was taught. Flexner's report is often credited with having laid the groundwork for modern medical education. Huge financial bequeaths were made by the Rockefeller and Carnegie Foundations, which in turn affected the fashion in which medical faculty would live their lives in academic medicine. Medical professors were to be freed from patient care responsibilities so as to dedicate their lives to teaching and research. At the time, most hospitals reluctantly tolerated medical student teaching. Students could receive good training in physical diagnosis and the use of certain medical instruments, but they were rarely permitted to have responsible contact with patients. Acting on his firm belief in the value of learning from patients, Sir William Osler, MD, in 1893, introduced the concept of clinical clerkships, and incorporated bedside rounds into student classes at Johns Hopkins University and, thus, the first true teaching hospital.

Paralleling medical education, surgical education has also undergone significant changes since its origin. Up until the nineteenth century, surgeons learned their craft through "apprenticeship,"[3] similar to the modern day surgical residency, followed by a "journeysmanship,"[4] similar to the modern day surgical fellowship. The typical surgical apprenticeship in the mid-sixteenth century started at approximately age 12 and lasted 5 to 7 years.[5] The young surgeon-to-be learned the craft through direct observation, then imitating the actions of a skilled mentor, both in the operating room and at bedside, providing history to the popular saying: "See One, Do One, Teach One." The masters taught with the same principle as the popular saying, they taught what they themselves had "seen" and "done." Without structure for what should be taught, guiding principles for training, or investigative inquiry for new methods or practices, medical education reached an unfortunate standstill by the late nineteenth century. The beginning of the twentieth century marked the first major shift from "apprenticeship" training to surgery residency as we know it today. The surgical training model used to train residents in the United States for the past century is, in part, due to the principles laid forth by William S. Halsted, MD, FACS.[6] The Halstedian training model was