

Effect of Curriculum Changes on Student Performance During General Surgical Clerkship

Elizabeth A. Hagan, BS and Bernard M. Jaffe, MD

Departments of Surgery and Anatomy, Tulane University School of Medicine, New Orleans, Louisiana

INTRODUCTION: Good clinical knowledge of anatomy, taught in medical school, is necessary for practicing physicians. It is a key feature of performance on the United States Medical Licensing Examination Step 1 score. Student performance on anatomy is also an early indicator of overall medical student performance. Unfortunately, curricular time provided for the teaching of anatomy has declined significantly over the last 30 years, leading to growing concerns that the anatomical knowledge of new medical graduates may not be adequate. Data regarding the impact of these changes to the medical school curriculum are lacking, with studies often being limited in number of medical students or time.

METHODS: This study examined the anatomy knowledge of students on third-year clinical rotations at Tulane University Medical School. Oral examinations were administered at the conclusion of the junior surgical clerkship. Data on performance were collected over a 5-year period from 690 medical students tested in their knowledge of anatomy, and the other basic sciences collectively considered as pathophysiology.

RESULTS: Over the 5-year period, student total scores by year increased in all categories tested. However, during the course of the students' third-year clerkships, the later in the year the students rotated on surgery, the more their scores progressively declined. Unfortunately, this fall was most severe in the knowledge of anatomy.

DISCUSSION: Although it is possible to teach anatomy in increasingly shorter periods of time, such that the students achieve high test scores in the standardized short answer examinations, it is clear that their knowledge, as applied to clinical care, rapidly declines the further they get away from Step 1 studying. Further study is necessary to elucidate the weaknesses in the current basic science curricula as they

pertain to anatomy and to devise mechanisms to assure retention of this critical science during clinical rotations and beyond into practice. (J Surg Ed ■■■■-■■■. ©2017 Published by Elsevier Inc. on behalf of the Association of Program Directors in Surgery)

KEY WORDS: Clinical anatomy knowledge, Dissection, Multiple-choice examinations, Basic science retention

COMPETENCIES: Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

Anatomical dissection is considered a fundamental cornerstone of medical education in the United States. From the first formal anatomy course in 1745 at the University of Pennsylvania, cadaver dissection grew immensely popular as an educational tool. The scarce supply created a whole industry of procurement, with medical students turning to grave robbing in the 18th and 19th centuries.¹ State legislatures began to enact laws facilitating supply of cadavers to medical schools starting in the 1830s, with laws allowing for unclaimed bodies of people who died in public institutions, hospitals, asylums, and prisons to be used for anatomical dissection.¹ In 1968, the National Conference of the Commissioners on Uniform State Laws approved the Uniform Anatomical Gift Act (UAGA), establishing that an individual's right to donate their body superseded the wishes of any next of kin. Reforms in 1987 standardized the process of body donation in the

TABLE 1. Average Student Scores for Each Year. Data Represent Percent. Total N = 690

Year	Anatomy	Pathophysiology
2010	86.1	88.1
2011	84.5	88.5
2012	85.6	88.1
2013	88.0	88.6
2014	87.3	89.2

Correspondence: Inquiries to Bernard M. Jaffe, MD, Departments of Surgery and Anatomy, Tulane University School of Medicine, 1430 Tulane Avenue, SL-22, New Orleans, LA 70112; e-mail address: bjaffe@tulane.edu (B.M. Jaffe)

Student scores on oral exam questions during surgical clerkship

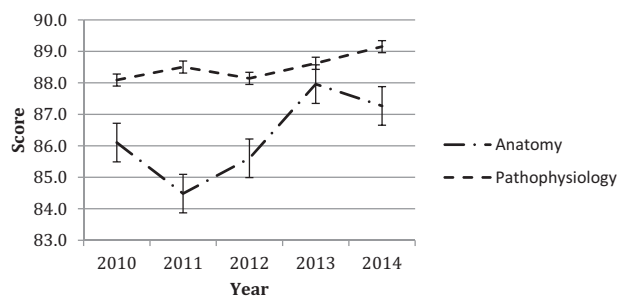


FIGURE 1. Overall average student scores for each year. Data represent percent. — · —, anatomy; — — —, pathophysiology. Bars represent mean \pm standard error.

United States, ensuring that human cadaver dissection is available to teach gross anatomy to medical students.

Mastery of anatomy is important to the future career of all physicians. Student performance in this first-year anatomy course, especially in human cadaver dissection, is positively correlated with student outcomes. Contrary to the potential needs of practicing physicians, current changes in curriculum countrywide include decreased hours for anatomy lecture and dissection. While scores on the United States Medical Licensing Examination (USMLE) Step 1 examination have marginally increased over time, concerns have been raised about how well these students are prepared for residency and beyond. Over the 5 years of this study, hours dedicated to teaching anatomy at Tulane University School of Medicine (TUSOM) have consistently decreased, falling from 16 weeks in 2008, 2009, and 2010, to 15 weeks in 2011 and 2012. Hours continued to decrease to 11 weeks in 2013 and 2014, to less than 10 weeks in 2015. This study was conducted to determine the effects of this curriculum change and determine whether the shorter course schedules have been destructive to clinical knowledge.

In this article, we discuss data related to anatomy knowledge collected during students' third-year surgical clerkship at TUSOM. These data represent information from students from the first class of students taught with a changing anatomy curriculum, through 4 subsequent years of progressive reduction in time spent learning anatomy. We looked at the performance of almost 700 students, in six different areas of anatomical knowledge compared to their scores in first-year non-anatomy basic science knowledge and total exam scores during their surgery clerkships.

Student scores by anatomical area during surgical clerkship by year

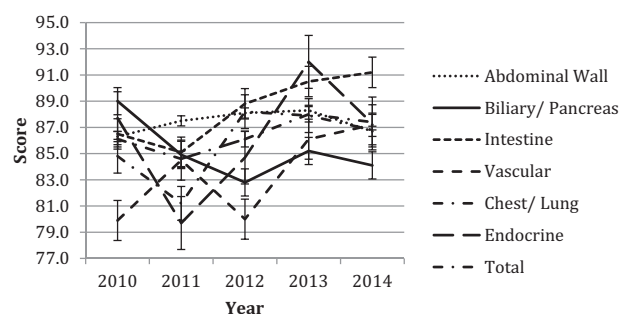


FIGURE 2. Average student scores by anatomical component for each year. Data represent percent. ·····, abdominal wall; —, biliary/pancreas; — — —, intestine; — · —, vascular; — · — · —, chest/lung; - - - -, endocrine; - · - ·, total. Bars represent mean \pm standard error.

METHODS

This study includes data from 5 years of student performance during their third-year surgical clerkship. Student performance was partially determined by oral exam scores. Thirty-minute oral exams were administered by faculty one-to-one to all third-year students at the completion of their 8-week clerkship. The technique of administration of the oral examination and the use of the exam book were reviewed with faculty annually to assure consistency. The exams were comprised of 3 multipart questions, each with multiple⁴⁻⁶ anatomic components, selected from a possible 27 questions contained in a standardized surgical examination book, which was used without change for all 5 years. As a result, students were each tested on a minimum of 12 and often as many as 18 anatomic facts. Students were told at the beginning of the clerkship which 27 topics they were responsible to know and would be tested. These topics were taught during the clerkship using a variety of techniques, including lectures, small group assignments, clinical rounds, problem-based learning, and online material. Each question included anatomy and pathophysiology (overall non-anatomy basic sciences). Required answers were listed in the exam book with designated point values for each answer. Grades for each question component added up to a possible 25 points, for a total of 100 points.

The data consist of 690 students' scores for 5 years, with 6 blocks of clerkship per year. The data were blinded to preserve student anonymity. Anatomy scores were compared to

TABLE 2. Average Student Scores for Each Year for Each Anatomical Area. Data Represent Percent

Year	Abdominal Wall	Biliary/Pancreas	Intestine	Vascular	Chest/Lung	Endocrine	Total
2010	86.3	89.0	86.5	79.9	84.8	87.7	86.1
2011	87.5	84.9	85.1	84.5	81.2	79.7	84.6
2012	88.1	82.8	88.8	80.0	88.2	84.7	86.1
2013	88.3	85.2	90.5	86.1	87.9	92.0	88.0
2014	86.7	84.1	91.2	87.2	86.8	87.3	87.4

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