COVID-19 Modifications to a First Year Medical Human Anatomy Course: Effects on student performance on end of course examinations

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Background

The sudden and unexpected COVID-19 pandemic in the U.S. in the Spring of 2020, necessitated changes in how medical educational offerings were delivered worldwide. The need for social distancing in particular represented a significant challenge for most medical schools. We describe here changes to the anatomy curriculum at the Virginia Tech Carilion School of Medicine (VTCSOM) that we implemented in academic year (AY) 2020-2021 in an attempt to maintain the high quality of our anatomy curriculum. We report the results of our initial observational effort to measure the impact of our curricular changes on student learning in anatomy.

The Anatomy Curriculum at VTCSOM

Anatomy is a relatively intense component of the curriculum of the first year medical student. At VTCSOM, the first year consists of four (4) Blocks, each eight (8) weeks in length with one (1) additional week for examinations. Each Block includes instruction in the Domains that the school was established, including Basic Science, Clinical Science, Research and Health Systems Science & Interprofessional Practice.

The anatomy curriculum at VTCSOM is in the Basic Science Domain and is four (4) hours per week of instruction during the first year. That instruction includes weekly faculty lectures in the classroom and student cadaveric dissection in the anatomy laboratory. Each Block has a designated focus. Block I focuses on musculoskeletal anatomy, Block II on cardiovascular & respiratory anatomy, Block III on abdominopelvic anatomy and Block IV on the nervous system.

At the conclusion of each Block is an End of Block Anatomy Examination. The examination is completed during a two (2) hour timeframe on a computer. The examination consists of both multiple choice and fill-in-the-blank questions. Some questions have pictures and some do not. The examination is blue-printed so as to include questions from both lectures and laboratories. The anatomy examination is 20% of the Basic Science Domain grade.

What Content Is Covered In Each Block of Anatomy?

Musculoskeletal Anatomy - Limbs and vertebral column (with consideration of bone, muscle, soft tissue, vascular and nervous components of the upper and lower limbs).
Cardiovascular & Respiratory Anatomy - Supra-diaphragmatic systems (with consideration of cardiac and respiratory systems).
Abdominopelvic Anatomy - Infra-diaphragmatic systems (with consideration of gastrointestinal, urinary and reproductive systems).
The Nervous System - Brain and spinal cord (with consideration of the bony, soft tissue, vascular and special tissues and organs of the head, including the spinal cord).

Curricular Modifications

Two areas of instruction that needed to be addressed with a COVID-19 modified curriculum were faculty lectures and student dissections. The modifications would not include additional instructional time due to limitations established by the Liaison Committee on Medical Education (LCME). The LCME is the accrediting body for medical education and requires for accreditation that no more 25 hours per week are spent on student learning activities.

Besides no additional instruction time, the most significant complication was the need to social distance in the dissection laboratory. Social distancing in the dissection laboratory required splitting the class of 48 students, which prior to COVID-19 dissected together for 2-3 consecutive hours each week, into two (2) groups of 24 students. Each group of students would spend only 90 minutes dissecting, one group following the other group during a four (4) hour period. Personal protective equipment (PPE) was also enhanced.

The four (4) hour period of time allowed for 90 minutes of dissection (Group A) at 8:00 a.m. followed by 30 minutes of laboratory cleaning at 9:30 a.m. and then followed by 90 minutes of dissection (Group B) at 10:00 a.m. Students PPE usage was upgraded requiring face shields. While this change resulted in an overall reduction in dissection time for each student, it improved the faculty/student ratio during each laboratory dissection from 3:48 to 3:24.

In addition, live faculty lectures, typically one (1) or two (2) per week, preceded each laboratory dissection. The COVID-19 modification required faculty to pre-record and post to Canvas a power point, voice-over power point or MP4 video for student viewing during the 90 minutes in which they were not in the dissection laboratory. The anatomy faculty believed the most benefit to learning anatomy was in the dissection laboratory, and so decided to forego the live lectures v. reduced faculty in the dissection laboratory.

Results

We compared mean anatomy examination scores for each of the four (4) Blocks of instruction during the four (4) years prior to COVID-19 with scores for each Block of instruction during the COVID-19 year (AY2020-2021). We found that performance on the End of Block Anatomy Examination for Blocks II, III and IV were comparable for all five (5) years reviewed (Table1). Performance on the Block I examination during AY2020-2021 (COVID-19 year) was substantially lower (including more student failures) than for the previous four years, reflecting a drop from an average of 78% for the four years prior to COVID-19 to 70% during AY2020-2021 (Table 2). However, performance in subsequent Blocks was comparable both before and during COVID-19 suggesting that students were able to adapt to the implemented modifications in the anatomy curriculum.

Table 1
Anatomy Examination Mean Scores and Ranges Over Four Years

	4 Year Mean	4 Year Mean Range
Block I		
Pre-COVID-19	78%	44.75% points
+ COVID-19	70%	71.0% points
Block II		
Pre-COVID-19	87%	31.25% points
+ COVID-19	86%	39.0% points
Block III		
Pre-COVID-19	89%	24.5% points
+ COVID-19	87%	37.0% points
Block IV		
Pre-COVID-19	81%	40.5% points
+ COVID-19	85%	45.0% points

Table 2
Anatomy Examination Mean Scores, Ranges and Failures

	Mean	Range	Exam Failures
Block I			
AY2016-17	80%	56% - 95%	N=10
AY2017-18	78%	48% - 98%	N=17
AY2018-19	77%	54% - 96%	N=17
AY2019-20	77%	48% - 96%	N=17
AY2020-21	70%	23% - 94%	N=24
Block II			
AY2016-17	90%	79% - 98%	N=0
AY2017-18	85%	58% - 98%	N=6
AY2018-19	88%	69% - 98%	N=2
AY2019-20	86%	61% - 98%	N=5
AY2020-21	86%	59% - 98%	N=7
Block III			
AY2016-17	90%	77% - 98%	N=0
AY2017-18	88%	79% - 96%	N=0
AY2018-19	92%	77% - 100%	N=0
AY2019-20	86%	71% - 98%	N=3
AY2020-21	87%	63% - 100%	N=4
Block IV			
AY2016-17	80%	64% - 94%	N=9
AY2017-18	81%	50% - 98%	N=10
AY2018-19	81%	55% - 95%	N=8
AY2019-20	82%	56% - 100%	N=9
AY2020-21	85%	55% - 100%	N=7

Discussion & Conclusion

The drop in the average student performance on the Block I examination following COVID-19 related instructional modifications suggests that some students were less successful in adapting to one or both of the modifications adapted for AY2020-2021, namely a reduction in overall dissection time a from three (3) hours/week prior to COVID-19 to 90 minutes/week during COVID-19 (despite increased accessibility to the faculty during each dissection laboratory) and a shift from live faculty lectures to pre-recorded lectures.

However, our data also indicate that students were able to make necessary adjustments to perform at levels comparable to those seen during the four years prior to AY2020-2021. We are now considering ways to better develop and deliver the Block I anatomy curriculum should we be required to continue implementing modifications associated with the COVID-19 pandemic.

References

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