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Engage in Exploration: Pathology Gross Laboratory in the COVID-Era

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Abstract

The outbreak of Covid-19 has changed education, including the mechanism of delivery of gross pathology laboratories. Herein, we describe how we revised our preclinical gross pathology lab to a flipped model to fit with COVID-19 regulations. A series of short, session objective-driven videos are made available online. Students are expected to watch the videos before coming to the hands-on lab. Groups of 2 students enter the gross lab on a timed basis and rotate through a series of stations. At each station, students examine gross pathology specimens while answering questions designed to apply the clinical correlation of pathophysiology and heighten observational skills. One or 2 pathologists are available throughout the lab session to address the questions from the students. The design of this laboratory exercise maintains appropriate distancing and hygiene in the time of COVID-19. The laboratory rooms are mapped to set up an appropriate number of timed stations. Flow-through of the rooms is unidirectional. Comparing with the traditional show-and-tell of teaching gross pathology, the renovated flipped model is genuinely student-centered and focuses on active learning. Holding the specimen in their hands, students learn from discovery as they are completely engaged by exploring the specimen and deriving answers themselves. The flipped learning gross pathology method has been very well received and evaluated highly by both faculty and students.

Keywords

active learning, flipped, lab, gross pathology, teaching

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Gross pathology labs allow students to handle specimens and appreciate the tactile and visual appearance of various pathologies.[1] At our institution, gross pathology labs cover the entire preclinical integrated curriculum and are designed using space retrieval practice to integrate material students have learned in both the current course and previous integrative curriculum courses.[2] The primary goal of the gross pathology lab is to identify knowledge gaps that have come up within student studies and use these sessions to close those gaps.

Traditionally, the gross pathology labs have operated in a "show-and-tell" model, with the instructor acting as a topic expert and demonstrating the specimen to a group of up to 15 students at a time. In the show portion, the instructor holds the specimen, points at the characteristic pathological changes, and explains the mechanism of the pathophysiological process. There are often questions and answers in the discussion between the instructor and the students. Nevertheless, most students did not have or take any opportunity to hold and evaluate the specimen themselves. This educational model, with multiple students standing close to each other, was not compatible with the lab safety regulations during the time of COVID-19.[3]

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In response, the gross pathology labs were redesigned as a flipped model. A series of short videos (5 minutes or less in duration) demonstrating the basic pathologies are made available online. Students are expected to watch the videos before coming to the hands-on lab. Groups of 2 students enter the gross lab on a timed basis and rotate through a series of appropriately spaced stations. At each station, students examine gross pathology specimens while answering questions designed to correlate clinical findings with gross morphology and pathophysiology and heighten observational skills. The questions are printed and laminated on one side of a page, and the answers are given on the reverse. Students have 5 minutes for each station. In addition to 4 pathology stations, there are donning and doffing stations for students to put on gloves, aprons, and masks and de-gloving, de-gowning, and washing hands, respectively. One or 2 pathologists are available throughout the lab session to address the questions from the students. The design of this laboratory exercise maintains appropriate distancing and hygiene in the time of COVID-19. The laboratory is conducted in a suite of 3 rooms. The rooms were mapped to set up an appropriate number of stations. Flow-through of the rooms is unidirectional. Floor mapping has been added to highlight this flow. Up to 17 individuals (15 students plus 2 faculty) are spread throughout the rooms. Workstations and individuals maintain a separation of approximately 6 feet. Movement between stations is synchronized by a timer and the sounding of a chime.

The restriction of occupancy in the rooms due to COVID-19 has presented a challenge of getting all students through the laboratory in one afternoon. This procedure accomplishes that in 4 hours, if constant attention is paid to the timing of each station. A surprising benefit of this lab course is that each student is allowed to handle and examine each specimen. Five minutes per station passes quickly, but good coordination of the videos with the individual pathology stations has led to a thoroughly engaging student experience, which appears better than the "show-and-tell" model regarding eliminating passive observation. Prior to our updated model, the students had already attended some traditional gross laboratory sessions and were thus able to compare the 2 first hand. The change to a flipped model of the gross lab was well received and evaluated positively by the students. Students appreciate the opportunity to physically hold the specimen themselves while using their observations to answer questions at a higher bloom's taxonomy level. "Gross lab is always enjoyable to attend. It is brief and to the point and always has incredible specimens to see that never fail to blow my mind." "I love seeing and feeling the aftermath of the pathology we talk about on paper." "This part of medical school cannot be replicated. You cannot 'feel' an organ and observe its pathology in 3D through the computer screen." Visualizing, touching, and feeling the specimen in real-time helps to integrate information from multiple subject matters including histology and clinical presentations, solidify, and connect the concepts. "I am really interested in seeing the gross specimens and correlating the physical findings with what we are learning in class, such as seeing different aortas with atherosclerosis, or heart sections, or lungs, etc." "I thought the gross pathology labs were incredible. They were a quick and easy way to really cement ideas in your mind and have visuals/tactile sensations to go along with these ideas and concepts." "I find that if I can see the gross pathology in person, it helps lock in the disease process into my long-term memory." The effort of preparing and organizing the lab is well noticed by the students. "I feel like the faculty puts in a lot of time in preparing for these sessions, and as a student, I want to support the faculty just as the faculty supports us." Students believe the short videos provide an excellent introduction to what they would see in the lab. They "love the path videos!" and say "prework videos are great!" They find the lab questions are intriguing and helpful. Students value highly the expertise of the pathologists and enjoy the one on one interaction with the faculty.

In flipped courses, solid and effective pre-class learning material is crucial for success.[4] Preparation of the pre-class material for a lab class is undoubtedly more complicated than a non-lab class. Based on our collective experience, we would recommend the following design strategy: First, establish clear learning objectives; second, select from available specimens and separate them into groups for specimen stations that best fit the learning objectives; third, compose 1 or 2 questions for each specimen station; and finally, make the pre-class videos of the specimens that will be at the stations. The questions for each station are in varied formats depending on the features of the organ systems. Some ideas for possible questions include "triple matching" questions that ask the students to match the specimen to a list of diagnoses to a list of descriptions of the observations that students are expected to make; or "true/false" questions that ask students to pick out the right ones from a short list of features either present or not present in the specimen; or short answer questions like "What is the diagnosis?" which fits well for congenital heart specimens. Multiple-choice questions that address etiology, pathogenesis, or clinical correlation are not unreasonable. The key here is to encourage students to critically assess the specimen for the presence or absence of the feature. The pre-class video should be short, succinct, and focused on the observations the student will make in the lab. It is important that students watch the introductory video before the class so that they can make the best use of hands-on time with the real specimen. A brief intro video or overview written description at the first donning station may be of value, depending on the specimen to be observed. In class, it is important that facilitators remain just that-facilitators. Be prepared to guide questions and discussions; however, let students lead the learning. Facilitators should observe students' interaction with the specimen and each other to understand the active learning process from the student's perspective. The students' questions, their confusing moments during the exploration, and the dynamics of the students' move from station to station all provide valuable information and insights for the instructors to optimize the introductory videos and in-class questions.

Careful planning and preparation are necessary for an effective and productive hands-on, active gross pathology laboratory learning experience within an integrated preclinical curriculum. It requires a combined effort from students,

pathologists, the lab manager, and the active learning team staff. Students are asked to come to the lab at the specific time slot assigned by the active learning team to avoid "overpopulation" in the lab at any moment. Scheduling and timing with other class sessions can be tricky during the COVID time. The instructor, lab manager, active learning team staff, course director, photographer, and video producer work together to make sure the pre-class material is in place before the class. Communication and coordination are essential as we create a new way to engage students' active learning in a gross pathology lab in the pandemic era.

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