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Editorial

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How Do We Teach Pathology?

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Recent publications dealing with pathology education have recommended that the traditional lecture-based approach be enriched with activities including computer-based learning[1,2,3] and group projects[4]. At our institution, pathology education is delivered successfully with an exceptionally low number of scheduled contact hours. With the limits imposed by the past and present curricula, pathology must be as active, engaging, and meaningful as possible. There is a single key to success - "Make pathology fun."

Since 1991, the author has been responsible for the pathology curriculum at Kansas City University of Medicine and Biosciences (formerly University of Health Sciences). The medical school educates physicians in the osteopathic tradition. In the United States, graduates of DO schools are licensed by passing either the COMLEX exam or the USMLE. Today, undergraduate and graduate education for Do's is substantially the same as for MD's, with the addition of a strong emphasis on physical and sports medicine and somewhat less focus on molecular biology. A major advantage of teaching in the DO system is that most students will choose primary care, and know they will need to recognize disease in every organ system. Another advantage is that students tend to think in very physical terms, and find it easy to comprehend the mechanical aspects of pathologic anatomy and pathophysiology.

...The author inherited a sequence of 125 traditional pathology lectures with no scheduled active learning time, all in the second year. This was almost exactly half of the average pathology contact hours for MD schools from the era. Prior to joining the full-time faculty, he was an outside lecturer who had organized an interest club...

The author inherited a sequence of 125 traditional pathology lectures with no scheduled active learning time, all in the second year. This was almost exactly half of the average pathology contact hours for MD schools from the era. Prior to joining the full-time faculty, he was an outside lecturer who had organized an interest club. The group called itself the "Dead Pathologists Society", and reviewed fresh autopsy specimens and solved New England Journal CPC's. The author replaced 25 lectures with non-graded active-learning labs, focused on CPC's presented by students, with the rest of the group submitting their answers. Pictures were introduced on the exams. Key images from the "Slice of Life" were cited throughout the handouts, and the school supported the new teaching paradigm by setting up eight pathology learning stations centered on the classic videodisks.

Today the pathology education team consists of the author, several adjunct clinical faculty, and two assistants at a time. These teaching assistants are physicians-to-be who have completed at least two years of medical school, and are working on their licensure exams. They spend one to three years with us, typically moving on when they pass boards. The adjunct clinical faculty members welcome students in their labs for preceptorships as opportunities permit.

Almost all students purchase one of the two recommended pathology textbooks ("Robbins" or "Rubin"). Students know that exam questions will come from the handouts, which are highly detailed and kept current, and that the textbooks are authoritative for exam question challenges. Learning objectives are given with each lecture, covering both pathologic anatomy and pathophysiology. The depth, as illustrated by the number of identification items for general anatomic pathology, seems equivalent to other institutions with more contact hours.[5] The handouts are available online and are interfaced with click-and-point links to the best online illustrations for each lesion. The GRIPE collection[6] and WebPath[7,8] are among the favorites. The "Slice of Life" numbers also appear. Students are often seen studying the handouts at the computer, making notes

on their hard copies and clicking the pictures online as they go. Students tend to do this in groups, and learn by reasoning together about what the pictures show.

...Today, we have 63 lecture hours during which we must cover general and systemic pathology. The author is responsible for these, and only a few are given to outside lecturers. Detailed handouts are provided. Most lectures begin with a chalk talk using the overhead projector. The major lesions are named on individual sheets of papers, and sketches are made as the instructor describes them...

Today, we have 63 lecture hours during which we must cover general and systemic pathology. The author is responsible for these, and only a few are given to outside lecturers. Detailed handouts are provided. Most lectures begin with a chalk talk using the overhead projector. The major lesions are named on individual sheets of papers, and sketches are made as the instructor describes them. Then lantern slides are shown. The order follows the sequence in "Big Robbins", which matches the handouts. I do not use text slides. Lectures are sometimes enlivened with short Power-Point presentations showing how pathologists solved riddles about public health or the illnesses of celebrities. The lecture on drug abuse is built around celebrity deaths.

We have approximately 45 hours scheduled for mandatory active learning / laboratory. The pathology labs are based on CPC's presented by the students. This begins in the first organ system ("Musculoskeletal"). The class of approximately 240 students is broken up into four groups. The students review the history and show the pathology slides, and the audience members may submit a diagnosis as individuals or teams. During the first year, students work in groups of three and present twice. During the second year, each student makes at least one individual presentation. Neither presentations nor responses are graded, and students are motivated to make the correct diagnosis because they are working with peers. Very strong work in lab earns a letter of commendation for the student's permanent file. Afterwards, the instructor or a presenter tries to get a group consensus using the Socratic method. Early in the first year, this is a challenge, but more experienced groups usually reach the correct diagnosis quickly. Afterwards, the presenter must explain how the pathologic findings caused the clinical findings, and handle questions for instructor and audience. During the first several years, it was occasionally necessary for a weak presenter to repeat the presentation. Today, peer pressure seems sufficient to keep the quality high.

When the first group of students who had completed the new pathology curriculum took the COMLEX exam, pathology was their strongest subject. This was a substantial change.

The pathology department has maintained excellent relationships with the other clinical and basic science faculty. We assist with teaching physical diagnosis, and we visit the anatomy lab when lesions are found and in need of diagnosis.

...Pathology practical exams are conducted at the end of each organ system block. There is no practical exam on general pathology. Students answer a few traditional multiple-choice questions focused on content from the lab exercises, and more questions about color photos that are provided. In addition, there are short-answer questions that are scored as bonus items. There are always perfect scorers, and a very wide spread of other scores. Lecture questions appear on the interdepartmental exams...

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always perfect scorers, and a very wide spread of other scores. Lecture questions appear on the interdepartmental exams.

During most of the organ system blocks, "Pathology" also provides an activity outside the scheduled curriculum time. Students schedule these individually, and everybody participates. We call them "Living Pathology".

During the "Introductory" system, students join one of the instructors in groups of three at our multiheaded microscope. They learn to operate the controls, and draw surgical and autopsy pathology slides at random from our collection. They must accurately identify red cells, endothelium, columnar epithelium, squamous epithelium show, collagen, fibroblasts, smooth muscle, skeletal muscle, glandular acini and ducts, lymphocytes, eosinophils, neutrophils, necrotic cells, and cancer cells with large hyperchromatic nuclei. The exercise takes one hour.

During the "Skin" system, groups of students review photos with an instructor and decide whether they are suspicious for cancer and deserving of excisional biopsy. They use a surgical kit to remove skin ellipses from an orange.

During the "Blood and Lymph" system, students prepare and read Wright stains at the multi-headed microscope. Red cell morphology, platelet estimate, and finding an example of each type of white cell is the essence of the exercise. Doing a hundred-cell differential count is an option which some students select. This takes twenty minutes for a group of three.

During the "Musculoskeletal" system, students join us in groups of 6-8 and review the common lesions of the knee and how to do a basic knee exam. This takes about half an hour.

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During the "Cardiovascular" system, groups of four students meet with a member of the pathology team and go over the basics of the cardiovascular physical exam on one another, while reviewing the underlying pathophysiology. This takes two hours. The anatomic variables make every session unique, and from time to time we find minor or major lesions. Last year, one student coyly let her classmates discover her ventricular septal defect, which they did without being prompted.

During the "Respiratory" system, there is a small-group exercise focused on actively correlating pathology and chest x-ray findings, and during the "Gastrointestinal" system, there is a similar exercise for abdominal films. This takes forty-five minutes.

During the "Reproductive" system, students join us in groups of 6-10 and each reads a known abnormal pap smear at the multiheaded microscope. This takes about thirty minutes.

The "Living Pathology" exercises are extremely time-intensive for the faculty, but are very popular with the students.

The school supports our efforts by a strong tutoring system. Students who like and do well in pathology are paid to lead groups, which typically review the material. There are guidelines for these tutors, and they are expected to be interactive and coax the students to become active with the subject. The teaching assistants also have the option of tutoring. The department conducts no review sessions, though the last few labs of the second year include picture quizzes (54 photos

each) in a game-show format, with teams participating. Board review is handled by a visiting pathology instructor and supervised by the curriculum office.

...Writers on pathology education have often emphasized the continued value of autopsy attendance when possible. Our students are invited, as the opportunity arises, to attend autopsies at a local medical examiner's office, as well as the author's courtesy cases. This activity is very popular. The author does a great deal of courtesy consulting, and "The Dead Pathologists' Society" still meets to review outside cases, especially homicides...

Writers on pathology education have often emphasized the continued value of autopsy attendance when possible. [9, 10] Our students are invited, as the opportunity arises, to attend autopsies at a local medical examiner's office, as well as the author's courtesy cases. This activity is very popular. The author does a great deal of courtesy consulting, and "The Dead Pathologists' Society" still meets to review outside cases, especially homicides. This is an optional activity and is very popular, especially with the vogue for such programs as "CSI".

When I placed my handouts online so that they could be accessed by third and fourth year students on rotations, I suddenly owned a pathology website that was popular with the public. Today as "The Pathology Guy", I receive around ten thousand visitors daily (http://www.pathguy.com/) .

The department offers two elective courses.

The first is in forensic pathology. Students attend a lecture series by a full-time medical examiner and complete a short essay. Autopsy attendance is not required for this elective, since most of our students attend at least one forensic autopsy during their two years here.

The second is the school's medical history elective, offered during the summer after the first portion of the licensure exam and before rotations. Groups of six to twelve students meet for six two-hour sessions. At each session, each participant presents a report on a book from our library's medical classics section. Discussion is lively as students spontaneously try to figure out what the classical writers are describing.

One of our school's ideals is spirituality. When discussion in lab turns to moral issues (as it sometimes does), students are encouraged to share their thoughts. The last lab concludes with a reading of an abridgement of Plato's "Phadeo", about the answers that Socrates offered others as he faced his own death.

As a department, we review system exams and offer our input. In any systems curriculum, some students will devote more effort to pathology than others do. If a student does poorly on a pathology practical exam, he or she gets a letter from the author offering to visit and discuss the problem, and a copy is sent to the advisor. We have several such meetings each year, and sometimes this results in a substantial improvement. Otherwise, we make no attempt to remediate the situation. At the end of the two classroom years, each student receives a letter summarizing his or her performance on the practical exams, and a comparison with the classmates. No separate pathology grade appears on the transcript.

One challenge is how to teach the efficient and effective use of the clinical lab in the classroom. Over the years, I have come to believe that this simply cannot be done, and must wait for rotations. We have one scheduled hour to introduce lab testing itself, and one on transfusion medicine shared with Family Medicine. We use the CPC discussion time in lab to review, and probably this is the best we can do.

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Pathologists are the natural integrators during the classroom phase of medical education. [11] , [12] I would like to recommend my approach to others. With a focus on CPC's and active learning rather than traditional lectures on diseases themselves, we never lose sight of the human beings. With an emphasis on testing using pictures, students must understand rather than merely learn word associations. Letting students choose their own cases and presentation styles gets their support, as having contributed to their own instructional design. Responsibility produces learning, and students keep the standards high to impress their peers. We let others do our remediation for us. Pathologists are natural physical diagnosticians, and I would encourage my peers to help as they are able at their own schools.

Our intense approach to pathology education has its rewards. Seeing students getting excited about my favorite subject is a pleasure. It is most satisfying to see student-organized tutoring sessions, or hear a fine presentation and watch most of the class get the diagnosis right, or to see a group of students in the library arguing about a fine point of anatomic pathology. Even a student saying, "Thanks to you, I understood what I was watching on 'ER'" lets the pathology team know the job is being done well. Despite some initial student resistance to the author's approach, in 1992 he was invited onto the stage during the variety show to be the subject of a song: "He made 'path' fun!"

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