

Commentary

A Call for Interdisciplinary Collaboration in Clinical Anatomy Education in WV

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Abstract: There is unrealized opportunity to create mutually beneficial interdisciplinary connections for research and education between clinical and anatomical sciences, with positive implications for students and patients in West Virginia.

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My career as a clinical anatomist began in veterinary medicine. I had just finished my BS in biology, already in love with anatomy. Seriously entertaining the prospect of attending veterinary school, I worked for a few years as a vet tech before ultimately deciding to train as a clinical anatomist and functional morphologist. Though I've spent the past fifteen teaching human anatomy in an academic setting, I still find myself drawing quite frequently from my vet tech experiences to help explain anatomical concepts. I'll catch myself mimicking the bark of a dog with laryngeal paralysis when I describe the courses and consequences of impingement on the recurrent laryngeal nerves. I describe the exceptional cases I saw (e.g., the time a vet I knew extracted a ureter instead of a uterine tube during a routine spay, the first time I witnessed peristalsis firsthand in a dog that had swallowed a mailman-shaped toy, or the gentle pit bull whose femur had fractured midshaft and repaired itself with the broken ends overlapping by several inches). Those are the one-offs, the exceptions that prove the

rule, the single instances that stick with you, and each has its lesson. Far more influential, however, were the "mundane" day-to-day cases that you'd see a hundred of in a week. I learned that flat-faced dogs get glaucoma, giant breeds get bone cancer, small breeds are prone to umbilical hernias, old cats go into kidney failure, pancreatitis cases increase around the holidays, and parvovirus thrives in the rapidly dividing epithelium lining the GI tracts of puppies. I could see, hear, and understand the difference between left- and right-sided heart failure and could explain the delicate balance between cardiac and renal issues. I also learned a great deal about my patients—what you could expect from them and what was too much—and their human families—the financial and social considerations involved in the decisions they had to make throughout a pet's life. All of these lessons played into my developing understanding of how critical anatomy was to interacting with, diagnosing, and healing bodies. If clinical insight in the veterinary sphere has been invaluable in my

understanding of clinical anatomy, it's not much of a leap to assume that familiarity with human clinical medicine would be a tremendous asset, and thus, perspectives from clinicians could supplement my own perspectives as an anatomical educator. This, in turn, can impact the degree to which students connect with the curriculum.

In the first medical anatomy course I took as a graduate student, medical students around me complained that they didn't see the point of taking anatomy; three years later as an instructor, I would interact with some of the same students, now familiar with real patients and protocols, and hear them lament that they deeply wished they could come back to review in the lab for a while. It's tempting to scoff at the young students' naïve disregard for the importance of the anatomy lab experience, but there is absolutely--at times--a cognitive disconnect between what we convey in the basic sciences and what the students feel they should focus on as they train, and it's one that I believe we can play off of to improve retention, understanding, and professional development in our students, which should be a priority. Anatomical errors are estimated to account for tens of thousands of unnecessary patient deaths each year in the US alone (Cahill et al. 2000); meanwhile, many curricula are cutting dissection contact time in anatomy courses, a trend potentially exacerbated by Covid-19. (Drake et al. 2009, Estoi and Bunt 2016, Papa et al. 2022, Tibrewal 2006). Students have less dissection experience and fewer contact hours in which to learn anatomy, and as such, relevance and memorability of the anatomical curriculum have never been more important.

"Clinical anatomy", which differs from classical anatomy in that we tie in clinical vignettes to help students understand the functional importance of structures, is one way of improving understanding and retention. Put simply, when you know what can go wrong, it is easier to appreciate what a

structure is for when everything is going right, and students who hope to heal are eager to think about the space between dysfunction and function, where they as clinicians will be needed the most. But the comfort I have with my firsthand experience in veterinary medicine contrasts with my unfamiliarity with comparable clinical concepts in human medicine for the simple reason that experiential learning is undeniably different than learning from textbooks, and this makes me feel that conversation and collaboration with clinicians could strengthen the way I teach, helping students connect classical anatomical information to the humans they will impact in their careers.

In fact, when students begin taking anatomy, we often refer to a cadaver as their "first patient". This phrase comes from a place of contemplation and respect: this was a real person with all the complexities of a full life, and though we can't speak with them, we bear this in mind and often see physical evidence of what each person would have experienced. Sometimes, though, I find myself thinking what *inverted* patients they really are. By this I mean that, when presented with living patients, clinicians work from an often-vague beginning toward some end point: they are posed with symptoms and assess these with images. They take patient histories and watch the diagnosis and treatment processes unfold over time. Anatomists begin at the end: we can often bypass imaging and directly dissect out and observe afflictions, but we have no backstory, no information on symptoms, and the story has already played out. And when students ask me important questions like: "Would he have known he had this?" "Could it have been treated?" "How would this feel?" my science-brain has to confess that I can only speculate. I don't have the insight that would come from a career of working through similar cases from beginning to end necessary to confidently address these questions.

In moments like these, I long to have easy access to clinicians, and I have the distinct impression that this goes both ways; when I do find myself in conversation with clinicians, we both hungrily grill each other. They ask me to explain details of anatomy associated with surgical approaches and the physical interconnections throughout bodies that highlight the limitations of treating symptoms too narrowly. I, in turn, ask for details on frequency, clinical presentation, and treatment options for things I've seen. There are things that our students will see over and over again the moment they start their rotations, and we could create a foundation of critically and holistically understanding these scenarios. I love to ask clinicians: What would you ask or review if you had the opportunity to work with an anatomist or cadaveric specimen again? What conditions or structures do you wish you had understood sooner or seen directly when you trained?

And while clinicians can provide insight about experiences in medicine, they can also shed light on the complex factors that intersect with the lives and health of patients in West Virginia. Another frequently-asked student question—often posed just after observing an advanced pathology in the anatomy lab—that deserves contemplation on educators' part is “why didn't the patient seek help sooner?” This question provides a key opportunity to discuss the need to see our population clearly and compassionately in the context of a spate of potential obstacles to care (e.g., geographical isolation, fear, availability of financial resources, childcare, information, insurance, and food, workplace hazards, and exposure to pollution), a combination of which is ultimately unique to our region of the world in a way that bears consideration as students begin to interact with our population (e.g., Hong et al. 2023, Krometis et al. 2017). If we hope to train clinicians who can critically assess a patient's wellbeing and provide people with the care they need, we are

remiss if we don't consider the socioeconomic and environmental factors that dictate frequency and severity of presenting cases, patient access to care, and how to ensure feasibility of follow-up care. I recently rode public transit alongside a man near tears because he was casually asked by a provider to “come back tomorrow” after taking unpaid time off work, arranging childcare and transportation, and paying a steep copay to be seen *today*. Maybe the situation was inevitable, but it's also possible he will fall through the cracks and fail to receive necessary care because a request that was perceived to be minor was, in fact, unfeasible. A disconnect between a student's “first patient” and any subsequent patients, and the experience of being a human facing challenges and fears is at the top of the list of the ethical and emotional intelligence that we should strive to cultivate alongside the intellectual component of our curricula.

Finally, anatomists are a resource. We can facilitate research. Nearly every conversation with a clinician I've had has unearthed questions at the crossroads of each of our areas of expertise that access to cadaveric specimens and imaging could help us answer, with the potential to improve our scientific understanding of the human body and improve treatment options. We can often also facilitate diverse educational opportunities. Clinicians ask if we could show trainees structures or demo procedures in the lab that they may not otherwise see firsthand, the answer to that often is, we would love to.

I can envision many diverse activities that we could pursue, but a few ideas include:

- Anatomists working with clinicians to develop workshops or tutorials for training or review for clinical professionals. In turn, these could then be developed into clinical applications for student education. Here, I would like to emphasize that I am intentionally using “clinicians” broadly, as I see particular need and opportunity for

collaboration with diverse allied professions such as medics and pathologists, in addition to physicians, etc.

- Building research collaborations to quantitatively investigate within the deceased body donors questions involving the prevalence or correlation of anomalies or pathologies that clinicians have qualitatively observed in living patients, in order to further understanding and treatment options.
- Anatomists shadowing clinicians in practice (field rotations, surgeries, autopsies, etc.) and following up with the clinicians to develop and updated clinical relevance of learning modules.

It's no secret that interdisciplinary collaboration in almost any field has tremendous potential for innovation, and, far from being an exception, this is a glaringly underutilized opportunity. The work needed to remedy this is hardly work at all. In fact, I think it is intuitive and fascinating. I'm calling on all of us—anatomists and clinicians of any type--to develop interdisciplinary collaborations, both practical and conversational, to bridge the cleft between trained anatomists and the resources available through our programs ranging from subject and research expertise to access to donors, and the experience and perspectives of clinicians, whose insight would help us to build better curricula for the applied analysis of anatomical knowledge in our students' clinical careers. Both perspectives are invaluable, and building off of them will benefit our students and their future patients in West Virginia.

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