The post-sophomore fellowship and other pieces of the pipeline

June 2022—*Jobs in pathology are plentiful and positions are hard to fill, which has put the pipeline in the limelight.* CAP TODAY *publisher Bob McGonnagle led a virtual discussion with two pathologists and a pathology resident about the post-sophomore pathology fellowship and other ways to make the true nature of pathology practice known to medical students.*

"There is a huge disconnect between pathology as it is taught to medical students and the practice and art of pathology," said Sarah Bean, MD, of Duke University School of Medicine.

Here is more of what she and the others said when they spoke on April 14.

Alexandra Isaacson, tell us where you are in your journey as a pathologist and about the paper you wrote about the University of Iowa experience of more than 20 years with the post-sophomore pathology fellowship.
Alexandra Isaacson, MD, post-graduate year-four pathology resident, University of Iowa Carver College of Medicine: I am a fourth-year pathology resident at Iowa. I graduated from the University of Iowa Carver College of Medicine and was also a post-sophomore fellow at Iowa. We noticed, particularly pathologists who had been around longer than I have, that about half our post-sophomore fellows ended up going into pathology. We also knew that the post-sophomore pathology fellowship at Iowa had been around since about the 1930s. We looked at 20 recent years of data and found that 43 percent of the 126 post-sophomore fellows between 1995 and 2016 chose careers in pathology (Isaacson AL, et al. *Acad Pathol.* 2019;6:2374289519851203). It was nice to see the data concretely, and then to see where people went who didn't end up becoming pathologists and that the post-sophomore fellowship was helpful to them in their practices.

Sarah Bean, tell us how you got to the post-sophomore fellowship and your thoughts about it now as you are a full professor of pathology.
Sarah M. Bean, MD, professor of pathology, vice chair for faculty, and cytopathology fellowship program director, Duke University School of Medicine: I did a post-sophomore fellowship at the University of Rochester. It wasn't technically speaking a post-sophomore fellowship in that I did it between the third and fourth years of medical school. When I was a third-year medical student, I did psychiatry and then a surgery rotation. I had done medicine before surgery. And I realized these areas of practice of medicine were not for me.

When I was in surgery I was paired with an oncologic surgeon. When we removed the specimen, he said, Send that to pathology; we need a frozen. I asked what it was, he explained it, and I asked if it would be okay if I went to the pathology lab to see what they're going to do. At that time it was a faux pas to ask to break scrub, but I did it anyway. And I'm so glad I did because I discovered the wonderful world of pathology, and I was immediately intrigued by that moment.

So I went to the registrar's office and asked if we could rework my third-year schedule so I could add a surgical pathology elective, and thankfully they were happy to accommodate the request. I did a six-week rotation on surgical pathology, and in the first two weeks I was paired with the chief resident and worked with him. For the last four weeks they put me on schedule as if I were a first-year resident, which was amazing. I loved it. After the end of that six-week elective, I realized I might want to be a pathologist. But what about autopsy? Am I going to pass out when I walk into the morgue and see an autopsy? Will it be scary for me? And what is clinical pathology, and will I like it? I had so many questions. I realized the rest of my medical school learning opportunity, in the traditional form, would not answer those questions.

I then found out about the post-sophomore fellowship opportunity and realized it was a good fit for me, so I applied and was accepted. When I was going through the system, the American Board of Pathology would recognize a year in a post-sophomore fellowship program as a year toward residency training. I was among the last group of fellows

for which that policy was in effect. In retrospect, I don't know if it would have changed my mind because I felt like I needed to answer those questions before I decided what kind of medicine I wanted to practice.

Robert Hoffman, while there have been many positive comments anecdotally about the post-sophomore fellowship, some people regard it as a mixed bag. One idea about why it's not more popular is that young people are not getting credit for an entire year. Do you have any thoughts about that?
Robert D. Hoffman II, MD, PhD, professor, vice chair for graduate medical education, and director of the pathology residency training program, Department of Pathology, Microbiology, and Immunology, Vanderbilt University Medical Center: I have been largely a consumer of the post-sophomore fellows; I was not one myself. But I can tell you having been a program director for 25 years plus, being a post-sophomore fellow is an advantage when being screened as an applicant. It's a huge indication of the commitment a person has.

There are several factors that go into the decline and lack of interest in the post-sophomore fellowships. One is that the credit doesn't seem to be much, although the experience at Iowa and other places that have strong post-sophomore fellowships, including the University of Missouri and University of Toledo, have kept things going well. Another impediment could be that you're taking a year out from your medical school and you want to make sure you'll be forgiven any tuition increases that might occur during that time. The places that have post-sophomore fellowships need not only make sure there's some recompense to the fellows who are in training, but also that they won't be disadvantaged in their tuition payments down the line when they reenter the medical program. Most places that have dropped their program probably did so because the fellowship didn't count toward residency training and there was not a way of attracting people to stay in their program.

Can you tell us why the American Board of Pathology had to drop the credit?
Dr. Hoffman (Vanderbilt): Several things were going on at the same time. The board had several different activities that used to count toward board-certification time, including research and post-sophomore fellowships, and it used to be a fairly liberal policy. With the increasing complexity of the board requirements and the things a pathologist needs to learn, I believe that the board wanted to make sure its training requirements were consistent with what was possible to bring somebody up to speed.

I came through the residency program at Johns Hopkins, and my class was the first class that required the fifth credentialing year, and my fifth credentialing year was taken up by my PhD dissertation research. The board used to offer credit for that. With the withdrawal of the fifth crediting year, the entire pathology training curriculum had to be tightened up.

Sarah, you said you were in one of the last cohorts that got credit. When were you in the program?

Dr. Bean (Duke): I was in the program in 2000–2001 and was among the last cohorts who could get credit for the post-sophomore fellowship. I graduated with a class of people who had done five years of residency and others like me who had done four years. I'm a bit of a unicorn in that I did only three years of true postgraduate residency plus a year in Rochester.

Alexandra, I'm assuming you didn't get credit for your fellowship but you knew pathology was four years?
Dr. Isaacson (Iowa): Correct.

Is there a lot of departmental support nonetheless for fellows at Iowa? There must be for it to be such a popular program.
Dr. Isaacson (Iowa): There's a lot of support for the fellows at Iowa. What works well here is that the fellows are integrated into the workload of the residency program, which medical students probably find to be unique—they go from more of an observer role on the rotations to an active role. Anytime you put somebody in more of an active role in whatever they're doing, it's going to make them more engaged because they're being given value and independence.

I knew when I did my post-sophomore fellowship that I was not going to get credit for it. For me it was a way to be exposed to the field of pathology. During my preclinical years, I was part of what you would call an "old" or "nonintegrated" curriculum. After my post-sophomore fellowship, the medical school switched to an integrated curriculum in which pathology was not its own course. So although I had exposure to the old way of doing things with a full-year pathology course, I still didn't feel like I understood what a pathologist did. The post-sophomore fellowship was a way to take a year to do something different and interesting that would give me more independence and time to do research. I ended up liking the field, but I didn't intend to go into a post-sophomore fellowship and come out as a pathologist. I think that is common, at least among the medical students here. There's enough interest in pathology to commit a year to it, but I don't think most people go into the year thinking they're preparing for a pathology residency.

What in addition to post-sophomore fellowships can be done to help medical students' understanding of pathology practice and who pathologists are? Robert, what can be done to improve that pipeline?

Dr. Hoffman

Dr. Hoffman (Vanderbilt): The fact that the post-sophomore fellowship is offered seems to be a factor that allows programs to produce more pathologists. Having been reading applications for many years and seeing certain medical schools pop up, I had the idea there are some institutions that are good at producing pathologists, but we didn't have a way of quantitating it. While I was on the CAP Graduate Medical Education Committee, we did a study in which we got data from the Association of American Medical Colleges that included not only the graduating class size for every year over 10 years but also the number of students who went into pathology. We could analyze by school which was the most efficient producer of pathologists per capita. We thought there were going to be a lot of factors in the curriculum that would feed into that, and we were surprised there were not.

One important factor that came out of the analysis was the ability to offer a post-sophomore fellowship—having the opportunity, the availability itself. To show you the range of the efficiency of medical schools in producing pathologists, there are about 20 medical schools that stand out as two standard deviations above the mean and another 20 or so that stand out as two standard deviations below the mean. The extremes were four and five standard deviations above the mean. It is compelling evidence that some medical schools are better at producing pathologists. This is in a paper that will be published.

Sarah, does Duke have a fellowship program now? If so, what is your experience there?
Dr. Bean (Duke): Yes. We reinstated our post-sophomore fellowship two years ago. The first year we had a class of two fellows and this year we have another class of two fellows. It's been a very successful program.

Our philosophy, which sounds similar to the philosophy at Iowa and was used when I was at the University of Rochester, is that we integrate our post-sophomore fellows into the workflow. They're essentially given comparable—not the same but comparable—responsibility as a first-year resident. It depends on the rotation to some extent. They are hands-on and are able to take ownership of patient care, which is important and educational and is kind of like a hook to reel them in.

Do you have experience with people who are interested in clinical pathology and that turns them on to the post-sophomore fellowship?

Dr. Bean (Duke): I wish I could say yes, but I have not met someone who has come to a post-sophomore fellowship with a potential interest in CP and come out with that specific, declared interest.

Alexandra, what's your experience on the clinical pathology side of the house?
Dr. Isaacson (Iowa): Our post-sophomore fellowship is AP heavy with opportunities for exposure to CP, which is great if you're trying to introduce the medical student to the breadth of what pathology is. But there has been no one in recent memory who has come in wanting to do CP and then focused the fellowship around it.

I was on a panel about a year ago with a pathologist who is chairman of pathology and laboratory medicine at a large health care system. Someone asked him what single most important lesson he learned in the COVID pandemic. He said you cannot have too many clinical pathologists in your department—figuring out how to pay for them, that's the real problem. Do you have a thought about that, Robert?
Dr. Hoffman (Vanderbilt): I likewise do not have much experience with post-sophomore fellows having gone into clinical pathology during their fellowships. When I was on the faculty at Case Western Reserve University, there was a fairly large post-sophomore fellowship. They would have about five who were thinking about pathology. The motivated people turned out to be very strong. Not all of them went into pathology, interestingly, but I think they all gained something from the experience and were able to carry it forward into whatever field they chose. It is good training for anybody who is going into medicine, to understand how the testing will be used.

But straight CP—I agree with that comment. We realized how valuable the molecular microbiology lab is during COVID, when the testing was going through the roof.

Many years ago a friend called from a university to say he had a great idea for an article about an introduction to pathology they had for new residents in which they showed residents what a microscope is and how to use it, among other things. At first I thought he was pulling my leg. We published that article and since then there are a few other similar programs. It shows how little exposure many medical students have to the real world of pathology. Have you seen that as well, Sarah?
Dr. Bean (Duke): There are probably many residency programs across the country that do something similar. They may call it boot camp—that's what it's dubbed here at Duke for our incoming residents. The content is variable, something as basic as how to use the microscope, how to do Kohler illumination, how to keep the microscope clean in between cleaning, how do I answer the neoplastic versus nonneoplastic question? Basic histology and pathology. Basic approaches to pathology are not taught in medical school.


Dr. Bean

There is a huge disconnect between pathology as it is taught to medical students and the practice and art of pathology. This disconnect is what a post-sophomore fellowship addresses, for people who are desiring to understand the difference. It's unfortunate we don't do a better job of highlighting exactly what we do as pathologists when we practice medicine. I wish there were a better way for us to teach that.

At Duke we have a pathology student interest group, and the leader of that group tries to find opportunities for the group to see what we do in practice, but those are just glimpses. It's not designed necessarily for the general medical student. The leader is also the course director for our Body and Disease pathology course, and she has students attend a tumor board or a conference that's multidisciplinary and where pathologists will be presenting pathology. She has them choose a patient and then as a group they have to learn more about the patient and the patient's disease entity. That's one way she has figured out how to help our medical students understand pathology and get exposure to the practice of medicine from a pathologist's perspective.

Historically at Duke the students had to observe an autopsy. And how off-putting can that be if you're a bit squeamish or you're grieving—anything. We had been leaving medical students with the impression that the autopsy is what we do. It's a part of what we do; it's not all of what we do.

Robert, does this resonate with your experience?
Dr. Hoffman (Vanderbilt): It does. Vanderbilt has a couple of different hooks we use for medical students, where we try to make sure everybody's exposed to pathology in an important way. In each of the core rotations at Vanderbilt there is a session that is dedicated to laboratory testing and how it goes off the rails if you don't communicate in the right way with pathology. You can apply that to every core rotation—gynecology, surgery, medicine. They hit the high points and make sure they understand what is a fair question to ask and what is not a fair question, and if you can polish a question a little rather than just check a box on a requisition, you'll probably get a better answer. That's important for every doctor to learn how to do.

The other thing they've done, which we've enjoyed, is you can offer an elective in surgical pathology during the surgery rotation. We have people spend a couple of weeks with us during their surgery rotation. These are people who are serious usually about surgery as a career and they come away from it with a much better idea of, How long does it take to do a frozen section? Or why can't I ask for my routine results the same day? Things take time, and they come to understand that process. And special stains. It's an eye-opener for a lot of them. That is a big hook.

The other thing I'm intrigued by is the accelerated program that Amyn Rojiani, MD, PhD, chair of pathology and lab medicine at Penn State, and his colleagues have put in place. Medical school applicants who apply for the pathology accelerated program and are accepted into the program will be eligible for residency after three years instead of four. They are streamlining the process (see CAP TODAY, March 2022: "At Penn State, a fast track to pathology residency"). Students who have the interest will do that, but it also creates the idea for people who may not have thought about it—Oh, that's something I can do. I think it has an advantage for people who have even an inkling of pathology as a career interest.

Alexandra, does every medical student at Iowa at some point enter the laboratory and look at the machines, histology, and pathologists' suites?
Dr. Isaacson (Iowa): All of the medical students who graduate from Iowa get a lab tour as part of the preclinical curriculum. They'll get to walk through the chemistry lab and see what that looks like. In the past there was a requirement to see a frozen section or an autopsy, and that has since gone.

The exposure to the day-to-day practice of pathology seems to be what we're missing out on for medical students. In the preclinical years, pathology is taught alongside biochemistry, anatomy, et cetera. But it's not a subject; it's a branch of medicine. I am interested in the ideas that Sarah and Robert brought up where pathology is being put side by side with surgery or internal medicine to show that this is what doctors do as well.

It's to our detriment that medical students aren't required to spend any time in pathology, besides a lab tour, before graduation. I don't know how ubiquitous across medical schools it is to have a required pathology rotation but it does seem interesting that every other specialty has some requirement, maybe with the exception of surgical subspecialties, and that people could get through their medical school curriculum and never set foot inside a real pathology lab, aside from what they're exposed to in lectures.

Sarah, I'm sure you would agree with that.
Dr. Bean (Duke): Yes, and there are some medical students who graduate medical school who do not understand that pathologists are medical doctors.

During the few times I've been allowed to be in a tumor board as an observer, it's been impressive how everyone seems to know everything about the patient and the case and there are all kinds of opinions, and when the pathologist begins, everybody gets quiet and attentive. I would think if I could expose a medical student to that, they might say, That's the kind of doctor I would like to be—where everybody listens and considers them to be leading the final diagnosis and planning. What do you

think about that, Robert?

Dr. Hoffman (Vanderbilt): That is the ideal, and we have a lot of opportunities here for the medical students, residents, and fellows to be exposed to pathology, and the tumor boards are one. We take autopsy seriously here. I direct the autopsy service at Vanderbilt and the Nashville VA Hospital and our VA service will do a case presentation on almost every case. And they pretty much hang on every word, and they will make a teaching opportunity out of it: Here's something we didn't know and let's try to pay attention to this going forward. One of the things I try to do in everything I do—I do heart pathology and autopsy pathology—is to be available to clinicians, and if they show an interest in seeing something, invite them in. Come on, let's go over this heart; let's go over this autopsy. And then we'll sit down and review the slides.

Virtual connection has made that easier. I can do a microscopic session for almost anybody I can contact by email. It used to be people had to drop what they were doing and walk across campus, and that is no longer. It has given us that much more opportunity to be available. And they love it.

Alexandra, do you have a final thought or a question for your colleagues?

Dr. Isaacson

Dr. Isaacson (Iowa): The post-sophomore fellowships are wonderful tools, but they're an investment for departments, if the department is doing it well, and an investment for the students who pursue them. If you were to counsel other departments, would you say that putting emphasis on or starting a post-sophomore fellowship is the best way to move forward? Or should we be putting more emphasis on third-year pathology clerkships or exposures in the preclinical years to pathologists? Where do you think the real worth is moving forward?

Dr. Bean (Duke): That is a difficult question, and the answer is going to be nuanced and contextual, depending on the institution and money available as well as the institution's goals, visions, and initiatives. The best approach is going to be multipronged. If an institution, organization, or department has money to support a post-sophomore fellowship program, they should do that.

We also need to be doing things like what I did with the *Washington Post* article ("What a pathologist does in a workday," Feb. 22, 2022). It was basic; it was easy. But it got the word out, and that was my goal—to tell people I'm a pathologist, this is what I do, and isn't this awesome? We need to find opportunities like that in pop culture and other media outlets as much as we can. I'm active on social media, trying to get the word out about what I do, who I am, and that I'm a multifaceted person.

We need to look to preschools and elementary, middle, and high schools, and start doing road shows if we can. There are pathologists out there doing that already.

Pathology student interest groups are another way to get the word out. It's a relatively easy thing for pathology departments to organize and shouldn't cost much money.

Dr. Hoffman (Vanderbilt): The post-sophomore fellowships are a positive thing. I believe in them very strongly. If you give me an applicant who has a post-sophomore fellowship and one who doesn't, all other things being equal, I will take the post-sophomore fellow hands-down. I am proud that we recruit post-sophomore fellows continually into our program.

We have a post-sophomore fellowship technically on the books here, but it has been years since anybody at Vanderbilt has wanted to do it. One thing you have at the University of Iowa, Columbia University, University of

Missouri, and University of Toledo is a tradition of doing it, people know it is a good thing, and they will follow each other into it. Some things get propagated like that, and I'm glad there are places that have it.

From our end we're trying to make the outreach more universal, trying to reach every medical student at some point in their training. I teach a pathology course for undergraduates at Vanderbilt. We do autopsy 101, and we show them hearts; it's largely run by the biomedical engineering department. But we've had French majors show up and take it and get a lot out of it. I think some biomedical engineers go on to medical school, and we haven't been doing it long enough to see how many decide to go into pathology. It is an eye-opener for them because they don't really understand what we do.

There's a well-founded consensus that we have a shortage of pathologists. I'm hearing that from academic programs, community programs, small groups, big groups—you name it. How do you feel the pathologist shortage is, Robert, and is there something that will help solve it?
Dr. Hoffman (Vanderbilt): I'm in a market that is growing rapidly in Nashville. We are expanding the size of our laboratories. During the next year we're moving to a new 100,000-square-foot facility four miles from the main campus. With that, I don't think there is any discipline in pathology that we're not looking to fill. We need everybody.

As a program director, my phone is ringing much more frequently—Hey, I'm looking for someone, who do you have? And the anecdotal stories I'm hearing from the residents—we have second-year residents who are getting cold calls from practices in their hometowns with serious inquiries about jobs. I've never seen this before. There's a real market for people coming out of training right now to go into pathology.

That's great news if you're looking for a job. If you're having to fill positions, it's not such great news, I suppose.
Dr. Isaacson (Iowa): I've read about this historical perception that the job market in pathology wasn't great, and that may have turned people away. Although the shortage is a struggle for the pathologist workforce right now, there may be an opportunity here for how we present the specialty to people who might be interested, that this is a good field to go into and there's going to be a lot of jobs in the areas you want to live.

Dr. Hoffman (Vanderbilt): Stephen Black-Schaffer, MD, and others predicted this years ago. He and his coauthors did a study that predicted a tidal wave of retirements would begin in about 2015 and peak in 2021 (Robboy SJ, et al. *Arch Pathol Lab Med.* 2013;137[12]:1723–1732). We've seen it. There used to be a lot more pathologists entering the job market from U.S. programs. There used to be a lot more U.S. programs than there are today. It has changed.

Sarah, how is the pathologist shortage affecting you at Duke?
Dr. Bean (Duke): We're hiring multiple positions. For us, thoracic pathologists have been difficult to come by. That's been our big challenge. Our hematopathology and gastrointestinal pathology divisions are constantly trying to find someone because our volumes are increasing and we need more people to help take care of all of our patients. So we're feeling it too.