



Chief Resident Oral History Project

R. Patrick Davis, MD, PhD

Keywords: Michigan; Watts; PhD; cardiovascular pharmacology; cardiovascular surgery; cardiac surgery; serotonin; I-6; accelerate pathway; Duke; intern; chief; Mike Mulvihill, David Ranney, Tunde Yerokun, Alice Wang, Shanna Sprinkle, and Mithun Shenoj; Linda Youngwirth, Danny Nussbaum, Ehsan Benrashid and Jina Kim. Allan Kirk; lung transplant; ex-vivo lung perfusion; joint training program

Justin Barr: Good afternoon. This is interview of Dr. Patrick Davis at Duke University Medical Center. This is Justin Barr on the 13th of May 2019. Thanks so much for joining us, Dr. Davis. I really appreciate it.

Dr. Patrick Davis: No, thank you. Good to be here.

Justin: Do you just want to start off by talking a little bit about where you came from, your undergraduate experience, and how you got into medicine?

Dr. Davis: Sure. I grew up in Southeast Michigan, suburbs outside of Detroit. My mother was a teacher, my father was an engineer. I went to a small undergraduate school in Michigan by the name of Kalamazoo College. This was a liberal arts school. The goal was a broad-based education, because at that point in my life, I didn't know that I was going to pursue a career in medicine, let alone surgery. At that time, I also continued my interest in athletic pursuits. I played college football there for four years.

Justin: What position did you play?

Dr. Davis: I was a defensive end for all four years, but maybe it was after my first or second year that I became interested in pursuing medicine. My initial interests were probably paralleling that of my father as an engineer. That was largely based on probably the location of where I was growing up. The majority of the adults that I was around were engineers who worked for the big three car companies at the time.

My interest in medicine was probably based on the education that I got when I was at college, as well as the interest of my peers. It was a small school where most of the people that I was surrounded by, both that I was playing football with as well as other people at the college, were interested in pursuing professional careers, whether that was medicine or law degrees or other health professional pursuits. That was a big driver. I guess the melting pot of the undergraduate college steered me in that direction.

Justin: Any key mentors from your undergraduate days?

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Dr. Davis: I don't think I can point to one person. My undergraduate experience, as I mentioned, was broad. I was exposed to things that I probably would not necessarily have pursued on my own if I was at a big institution. In reflection of that, I would say, I'm immensely grateful of doing things that I wouldn't necessarily choose on my own. That's maybe a theme throughout my training, and I'm certainly better for it.

Justin: Eventually, you applied not just to medical school, but to an MSTP program.

Dr. Davis: Yes. I think my interests were humble at the beginning, but once I got a taste of it, I ran with it. I was initially interested in going to medical school. When I originally applied and was accepted in medical school, it was with the idea that I would get a medical degree alone. I rapidly fell in love with the idea and found some great mentors who got me into the idea that I could not only be a medical or surgical practitioner, but that there was something else that I could contribute to the field as a whole, and I really gravitated towards that.

I thought that there was hopefully more that I had to offer. I thought there was something honorable in contributing to the body of knowledge or body of work that was medicine and surgery at that point.

Justin: Was this discovery in your first year of medical school?

Dr. Davis: Yes, I would say my first year of medical school is really when I cemented and I knew that I was going to spend some time in the lab, and that I wanted to pursue a PhD because I thought this was the right vehicle for that pursuit.

Justin: Just for the record, where were you at medical school?

Dr. Davis: Michigan State University.

Justin: How easy was it to transition from a straight MD program to a combination degree program?

Dr. Davis: I hit the ground running when I was at Michigan State. I really drank from the faucet or the spigot and embraced every opportunity that came along in that early part of my career. I found a lot of people who became enthusiastic about helping me make that a reality. I hope they saw some potential that I was capable of doing both of these things. I think they saw some true joy in the scientific pursuit, so they were happy to open those doors.

Justin: Who were some of those key mentors at Michigan State?

Dr. Davis: The one person that really did it was, whose lab I was in - she was my PhD mentor, PhD advisor -- that was Dr. Stephanie Watts. She is a PhD pharmacologist by training. I spent several months in her lab, and it was a true joy. She was happy to teach, I was happy to learn, and it was a great match. She's really the driver of the



scientific side of me and is probably responsible for a lot of the great things that have come out of that.

Justin: What did your research focus on during those years?

Dr. Davis: Her lab was primarily focused on cardiovascular pharmacology. She had a few R01 funded grants that were investigating in the role of, very broadly, serotonin and blood pressure regulation. My research was mechanistic in nature and how looking at the different ways that serotonin affected blood pressures in a very paradoxical way.

The long-held medical textbook would tell you that serotonin acts as a vasoconstrictor, it's released by platelets, it's key in hemostasis, and the thought was elevated levels of serotonin were responsible for, or may be responsible for elevated blood pressure. We got interested in studying more how serotonin affected the body as a whole, and what role it played.

Justin: Were you be able to conclude?

Dr. Davis: What we found is that there were a number of serotonin receptors throughout the body, but its primary effector/receptor was central. The blood pressure lowering effect that we saw with serotonin was centrally-mediated rather than a peripheral vascular bed.

Justin: This doesn't sound immediately applicable to surgery. Did you go into medical school planning on surgery, or when did you decide to pursue that career trajectory?

Dr. Davis: The reason that I went to medical school was surgery. When I went to medical school, I knew I wanted to be a surgeon. When I became interested in what was going on in the lab, it was under the auspices of that I was going to be a surgeon. It was no surprise to everyone that somehow, for all parties involved, we had to find a way to make this marriage work. Like I said, there was an enthusiasm out there about what the substrate was, or what we could potentially mold this into.

Everyone certainly had their reservations about whether it would really work -- whether you can be a thoughtful scientist or a thoughtful surgeon, for that matter, and do both and do both very well. Fortunately, I was persuasive and convinced everyone that the benefits far outweigh the risks of this training pathway, and that I was going to shoulder most of the work, at least bringing me to a seat at the table to try and make a meaningful contribution.

Justin: Was the surgery department at Michigan State equally enthusiastic?

Dr. Davis: I think they were. Michigan State does not have the same academic tradition as the surgery department here at Duke, but that being said, there was enthusiasm for what was being undertaken.



Justin: When you were applying for residency, how did coming out as an MD PhD affect your application process and your interviews?

Dr. Davis: It was nothing but a benefit. It opened a lot of doors, it was something that was easy to discuss during the interview process. I took the interview in the residency application process really as much for me finding the right place as it was for the reverse: them trying to decide if I was the right fit. I thought with all that training at that point that I was the right fit. It was more about where I wanted to go. Now that being said, not every place I went bought into the idea of the surgeon scientist. Historically, there were more places to do research and embrace this model. Now you need to be a little bit more persuasive to find the right place to do that.

Justin: Since you're interested in cardiac, did you ever consider applying to be accelerated I-6 pathway, or are you always intent on doing some form of general surgery first?

Dr. Davis: When I applied, it [I-6 pathway] had existed only for maybe three or four years, and it hadn't even graduated a class of residents, Stanford being the first program. I don't think they had yet graduated their residents through their accelerated cardiac program. For the field and for me, it was an attractive option in that I wanted to get the appropriate clinical training in an expedited fashion to be able to ask very poignant questions. The only way you're going to have a successful scientific career is if you have a narrow scope of your clinical practice. It was an attractive idea.

Most of the people that I talked to, or most of the people that were close to me, expressed very thoughtfully concerns about an untested, unproven training pathway. As I began the interview, that became more clear to me. As much as I wanted to speed the process along, they were right. I guess the saying, 'you don't know what you don't know', was very pertinent, and I deferred to people that were much senior to me on how to approach the whole process.

Justin: You ended up choosing Duke. What was Duke's reputation at the time, and what made you decide to rank it highly?

Dr. Davis: What drew me to Duke was twofold. It had a long and steep tradition of training people that pursued academic careers in surgery. Their track record was something that drew me. I didn't want to go this far into my training and then go somewhere that if I put the remainder of my training in their hands, that they fumble this. It's great to be a single beacon of excellence, but sometimes it's better to surround yourself and be a part of like-minded people. That's what drew me.

Then the other component of that was, I was interested in cardiothoracic surgery. This was, had long been a place where many top surgeons in the field had come to train, and it seemed a perfect marriage.

Justin: What year did you start as an intern, and who was in your intern class?



Dr. Davis: I started in July of 2013. My categorical class at the time was Mike Mulvihill, David Ranney, Tunde Yerokun, Alice Wang, Shanna Sprinkle, and Mithun Shenoi.

Justin: How would you compare your intern experience in 2013 to the interns you're currently in charge of supervising?

Dr. Davis: A lot has changed in a very short time. When I was an intern, we were on the cusp of involving more advanced practice providers in the service, which is very common now. The overall task of the intern now versus then are not vastly different. A lot of it is offloaded to advanced practice providers which frees the interns up to do more operating, or at least provide maybe a better balance of service versus other pursuits, and we'll just leave that broadly.

The other thing that I enjoyed about our experience as interns is, there was an expectation back then that you were going to do things a certain way. There is a lot of interest in how the interns now perceive their training. There was less interest in how we perceived our training, and there was more emphasis on our training, if that's fair.

Justin: You managed to operate a lot in your first year...how many cases do you remember that you did in your first--

Dr. Davis: That's correct. I want to say almost 200 cases, maybe 186.

Justin: How did you manage to get these case numbers in an era where operating was not emphasized for interns?

Dr. Davis: I tried to approach all aspects of my training in a thoughtful way, and I tried to read a lot about what the historic benchmarks for certain things were. When I came to residence here intern, I set a personal benchmark that I wanted to try and get 100 cases done or be involved in some aspect of 100 cases. That would be the appropriate level of exposure to keep me moving forward. When you're an intern, there's a defined set of tasks that you can do. No one's going to tell you can't show up to the operating room.

Broadly, training is a collection of experiences. The more you expose yourself to broad brace training, the better you're going to be. It was simply a desire of mine to be in the operating room, and I wasn't someone who was interested in making excuses why I wasn't going to be there. I simply found ways to get there. If it meant that I went at the end of the day, it was a place that I truly enjoyed to be. If I had a challenging logistical day, what was relaxing, personally for me, was maybe instead of going home at the end of the day, going to the operating room and re-centering and bringing some thoughtful insight of where I was headed. It was always a space that I worked and desired to be.

Justin: Any fun stories from intern year?



Dr. Davis: There's probably lots of fun stories of-- that other people might have about me. I'm not sure that I have anything in particular. We were here a lot. I hope we helped a lot of people. There were a lot of lack of experience, and we all spent most of our-- no one would ever admit it, but you spend most of your time worried about what you're doing. It was truly an enjoyable wealth of experience. I wouldn't pass it up.

Justin: People say JAR year is one of the more challenging years in the residency. Do you agree with that statement, and how was your JAR experience?

Dr. Davis: I think it is. You are largely protected as an intern. You get to learn to be a doctor, but at least in the era that we trained, it is a protected experience.

The JAR experience, I would say, is probably one of the more challenging years. It's when you have to step into the light and assume a role of responsibility that wasn't previously there. It's your opportunity to interact with the hospital in a much more meaningful way. I think for some people, that could be challenging.

Justin: You took an unconventional course doing a third clinical year before going into the laboratory. One, what led you to choose that order of things? Then two, how easy was that logistically to execute?

Dr. Davis: I struggled with the decision of whether to do a year of research or a post-doc year. What was the right thing? My initial thought, based on mentors and advisors and things like that, was, you want to be thoughtful and immersed in your clinical training, and then you're given the tools to go and be successful at the end in terms of being a scientist. My original thought was to run straight through residency to get all the clinical training and then work to get a lab setup.

What I realized as time went by was that I was beginning to be a bit more distanced from the lab than I wanted to. I had many discussions with Dr. Kirk about this, about how he would approach this. I think he helped me come to the decision that this would be a nice point in my training to sit, take a year and reinvent myself as a scientist, and really lay the foundation or the groundwork to make thoughtful contributions when I was done.

Justin: What did your research involve in that year that you took?

Dr. Davis: Dr. Kirk was gracious enough to let me work in his lab, and I worked on several of his projects. My real discussion with him, or interest for my own research, was about my interest in lung transplantation and specifically the emergence of a new preservation strategy, which was machine perfusion, or what has become known as ex vivo lung perfusion. When I sat with him, I told him that I wanted to establish a model, an ex vivo lung perfusion and a lung transplant model here at Duke or in the lab, and that's really what I set out to do.

Justin: Do you feel like you accomplished that goal?



Dr. Davis: Absolutely. It's something that exists to this day and that's another thing that we had hoped to do: not only reinvent myself as a scientist in the lab, but create a scientific project or a model that would become self-sustaining to create something that could exist while I returned to clinical duty for the remainder of my training, and that it would be something that I could balance and be thoughtful about.

Justin: What are the implications of this model for development of ex vivo lung preservation and then down the road of actual lung transplant?

Dr. Davis: The principles or the original rationale behind ex vivo lung perfusion was to be able to evaluate more lungs for transplant. It was a pivot or a paradigm shift from cold static storage where the organ was just preserved in ice, and the cold ischemic time was whatever the required travel time was from donor to recipient. The ex vivo lung perfusion was an idea that we could take lungs from a donor, potentially a non-ideal donor, ones that would historically have been turned down, or that had some reason to not be used. We could perfuse these in a thoughtful and monitored way, ventilate them, and determine their function and their potential post-transplant function.

That was the original intent. They've been able to show that that's successful compared to traditional methods of storage. I think what the true benefit is and what we're headed to is a much more scientific way of transplanting organs and moving organs across the country, not only from a sense of being able to monitor and predict how they'll perform once they're transplanted, but also being able to intervene on the organs before transplant to make them a better organ. I think in a very simplistic way is, not only do we need more organs, but we need better organs. This is hopefully a platform where we can come up with very novel techniques to broadly intervene on making a better organ.

Justin: Sounds like a project with many future potentials.

Dr. Davis: Yes. I think the other reason I want to reinvent myself was I wanted to have a project in its infancy, and with many legs. I learned very early on, and I'm very grateful to my training in the lab during my PhD. I think it was instilled on me very early on some of the fundamentals of being a scientist, which I will carry with me for the rest of my career.

Justin: You mentioned Dr. Kirk's influence. Was he chair when you arrived?

Dr. Davis: He was not chair when I arrived. He showed up my second year as a resident.

Justin: What changes did he bring to the program?

Dr. Davis: He helped reshape the program in ways that I don't think can fully be described. He pivoted the program back in a direction that returned some of the strength to the residency, brought some of the focus back to academic research, and

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for me personally, it was very nice to find a chairman, a mentor who had successfully traversed the gap between surgeon and basic scientist. I was rewarded with my decision to come to Duke, with its history and tradition, by its ability to bring back some whom...I can't imagine a better or more perfect mentor to help create a scientific career for me.

Justin: When you applied, there was no permanent chairman?

Dr. Davis: There was not. Ted Pappas was the interim chair at the time. There was no discussion about who would be chair. I knew that the leadership at the cardiothoracic division was very strong, and that's ultimately where I was headed. I had very few reservations about who was going to be put into that role.

Justin: Speaking of cardiovascular surgery, you came back from the lab into the joint training program. Do you mind describing just a little bit about what that is, and then how has that affected your last two years of residency compared to your colleagues who stayed in general surgery?

Dr. Davis: Sure. The joint training program is a fast track or an early entry into fellowship training, and was acknowledgement that maybe two things. One, that they needed a way to reach and recruit the right people to cardiothoracic surgery. The other is that the length of the training was maybe too long, and there would be benefit from starting to train people a little bit earlier in their career.

The way it evolved for me, is that I applied to the joint training program in my third clinical year or after my sar-1 one year, and before I entered into my sar-2 year. Then my SAR-2 and my chief year were split. Half of the year was general surgery, half of the year was spent on cardiothoracic months or rotations.

Justin: How did that experience differ from your general surgery colleagues, or how did that change your residency for you?

Dr. Davis: It gave me an early focus on my fellowship training where my general surgery colleagues or peers were still securing those positions. They were maybe branches off a more traditional path. I spent a little less time in my final two years doing general surgery compared to my peers. I would say that's the main difference there.

Justin: Do you feel like you lost anything by not being Chief of service as much or whatever losses were more than made up for by the early cardiac experience?

Dr. Davis: I worked very hard to remain a part of the general surgery residency. There's a big pull to differentiate and delineate oneself, and I certainly felt that pull. I think that Chief here in our residency year, at least at Duke, there's something to be said or something to be learned from it. I didn't want to forgo that completely. I made a point to try and be involved or at least keep an ear to the ground even when I was on a cardiac or thoracic month, of what the ongoing of the residency were within the general surgery program.

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Justin: On the flip side, how were you accepted into the cardiothoracic program as effectively a clinical 4th year compared to the clinical sixes who were also starting the cardiothoracic fellowship?

Dr. Davis: My application or interview process was internal.

Justin: My question wasn't very clear. You're coming in with two years less experience than the traditional first year fellow. How did the attendings interact with somebody who is just not as experienced as they're used to training?

Dr. Davis: Surprisingly well, I think, probably for two reasons. One, given the excellent relationship between the division of cardiothoracic surgery and the general surgery residency, at that point in my residency training, I already knew a lot of the attendings or had a working relationship with them pretty well. It was easy to step into the OR and have meaningful experiences with them.

The other thing is, I think you are selected in the joint training program under the auspices that you can hold your own clinically, even with your peers that may have a little bit more training than you.

Justin: Then since you've been part of the clinical joint training program, Duke has been accepting I-6 applicants, which it had not been when you applied as an intern. How are these now three different models of training for cardiac surgery integrated at Duke, from your experience?

Dr. Davis: So far, so good. There hasn't been a big hiccup or hurdle in the training now. The I6 training residents are not fully matured; we haven't graduated any of them yet. We haven't seen them interact at the senior level. I think the leadership has done a very thoughtful job in terms of trying to take the right amount of residents. We are blessed to have robust volume. There's no shortage of work or cases to get done. I think it supports multiple training models. I think the traditional fellows benefit from the joint training fellows early on when they first show up at Duke. There's a very collegial relationship that occurs where we can help navigate the health system and the hospital in a thoughtful way. I think for the I6 people, they have an extreme benefit to have a very collegial relationship with the joint training and traditional residents so that they can learn and be trained up in an appropriate way.

Justin: This year, you're chief. Who else makes up your chief class?

Dr. Davis: My chief class is Linda Youngwirth, Danny Nussbaum, Ehsan Benrashid and Jina Kim.

Justin: It may be fair to say that this year's chief class is not as cohesive as chief classes have been in the past. How's that affected your experience this year?

Dr. Davis: Our chief class was made of very unique people, very unique personalities. Taken all on our own, I think there's a number of very distinguished and hardworking



people. I think most people in our chief class would echo this sentiment: it has been, at times, a bit disappointing to have those disagreements and clashes. I think we've been able to, hopefully, been good stewards of the residency.

Justin: Now that you've been here six years, what changes have you seen in the program?

Dr. Davis: There is an abundance of resources for the residents. Whether they existed when I was a junior resident or not, maybe it's something simply that I wasn't aware of. Dr. Kirk said once to me, he said, "I truly want this place to remove barriers so that the limiting factor in getting your work accomplished is you and only you." I thought that was pretty good, because people are full of excuses for not getting things done. To have a chairman or someone that's in charge saying, "Look, I'm going to take all that away." Then the only person to blame, if you don't skyrocket to the top, is yourself, is I think a pretty powerful motivator, but also pretty terrifying at the same time.

Justin: This year, you guys have been having one-on-one meetings and class meetings with Dr. Kirk. What have those meetings been like?

Dr. Davis: Those are really a great opportunity to sit and get to be mentored, at least when you're doing your administrative chief time, on a one-on-one basis. It's really your time to steer the discussion to whatever you're particularly interested in. A lot of Dr. Kirk and my discussions were on traversing that gap between where I am now and where I hope to be in terms of a young faculty member with a lab and pursuit of independent funding of my own. He was a great mentor with wealth of information about how to get that done.

Justin: What are both your thoughts and his thoughts on a cardiothoracic surgeon with the lab? Because that entity exists elsewhere, but I don't know anyone at Duke was a basic science lab and a clinical cardiothoracic practice?

Dr. Davis: I think he and I both, early on, acknowledged that it was a difficult proposition, but something that was absolutely needed-- It was a space that needed to be filled. I think we both acknowledged that there was definitely reason to do it, that it was not going to be easy. I guess the rate of attrition or the fact that a lot of people maybe sat in that chair and said, "This is what I want to do," and are not doing it at this point was a reality.

As I talked about doing a postdoc year, one of the other things that he said to me that I thought was very profound or has stuck with me, he said, "I can't guarantee you success, but the worst case, at the end of the day you're going to be a heart surgeon trained at Duke." I thought, well, that's not too bad. He said, "Not too many people can say that." I said, "All right, very good, sir. Here we go. Let's see how high we can reach." If the floor is a Duke trained heart surgeon, that's not too bad.



Justin: No residency program is perfect. If you had a magic wand to wave, what would you change about Duke surgery to improve the experience?

Dr. Davis: That's a hard question, because I truly enjoyed my training here. I think for everything that I disliked at the time, reflecting upon it, there's some value in the struggle. I think if I were to change a lot or I were to suggest changing a lot of things, it would be to my detriment or to maybe the residency as a whole in that there has to be some pressure along the process or there's no push or momentum to improve. Now it can't be soul crushing, but I think there has to be some struggle to make the final product, otherwise you're just coasting through and you may be able to tie knots very well, you may be able to do the required things. Your resiliency or your strength when you get out and are independent may not be there. Now, that may be my belief. I think there's lots of probably small minute things.

The one thing I've learned about the residency or residents as a whole or as a chief resident, is that people will always want more. You could give them lunch, and they'd want dinner. You could give them six weeks of vacation, they'd want nap time during the day, and they would still be unhappy. There are many things that you could change, many things that you could improve. I'm not sure that it would vastly improve the product as a whole.

Justin: Great point. Any mentors over the last six years who have been particularly influential in your career?

Dr. Davis: Yes, I think we've already talked about Dr. Kirk. I'm very lucky to have him return to the department when he did. The faculty and mentors that came out of my general surgery training are immensely valuable, despite my chosen profession. They taught me how to be a good resident. They taught me how to be a good surgeon. They taught me a lot of resiliency that will make me better in the future.

Justin: Anything I didn't ask you that want to make sure we get on the record for this interview? Okay. Well, thank you much for your time. I really appreciate it.

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