

Interview with Dr. Jeffery Keenan

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Barr: Good morning. This is Justin Barr recording Dr. Jeffrey Keenan on Thursday, May 3, 2018 at Duke Hospital. Jeff, thanks so much for joining us. Could you talk a little bit about your background, where you were born, where you went to college, what made you decide to become a doctor?

Keenan: Thank you, Justin. I was actually born in Brussels, Belgium. People don't realize that, but I was born abroad, but I was born an American citizen. My parents happened to be over there for a couple of years because my dad's company sent him there for some international experience. We came back to the US when I was about one, so I never really remembered that at all. We lived in Baltimore, Maryland my whole upbringing. I went to a small private school, boy's school, growing up, starting with kindergarten. I went there all the way through 12th grade. It was called the Boys' Latin School of Maryland.

I think I was always pretty good at math and science. I had an affinity in particular to biology and chemistry. I was a first child and very goal-oriented and sort of looking ahead kid, and my parents certainly encouraged that. By the age of 16 or 17, I decided I wanted to do something in the sciences and the thing that made the most sense to me was to become a doctor and practice medicine. Even though I didn't know what the whole field might entail, that was my goal from that time. I went through the college admissions process, and I ended up going to the University of North Carolina at Chapel Hill.

Barr: Did you have any physicians in the family who were inspirations or mentors? How did medicine jump out of the math and sciences as the most logical career?

Keenan: Honestly, no one in my family, nobody is in medicine. There's no relative that I know that is a nurse, no relative I know is a doctor, no relative I know that does anything in science. Actually, thinking about it, I had two experiences when I was a teenager. One was when I was 14. I tore my ACL playing basketball, so I got an ACL reconstruction and I became acquainted with the medical system that way. Then, when I was 15 or 16 I developed a spontaneous pneumothorax and got a chest tube, and ended up getting pleurodesis. I kind of became acquainted with medicine that way.

I had actually forgotten those experiences played an instrumental role. I liked the sciences, I had those experiences as a patient myself. It certainly introduced me to medicine and the importance that medicine can have on people's lives. Those things together made medicine seem like a natural fit. Also, some of my parents' closest friends were physicians and they were people that I looked up to. I certainly admired my parents too, but they were both accountants, and as much as I think that they

enjoyed their work in many regards, I kind of thought, "Well, maybe I'll do something different than accounting."

Barr: You say you matriculated to the University of North Carolina at that point, intending to be pre-medical?

Keenan: Yes. It was UNC Chapel Hill, I went through their admissions process. It was funny, the high school I went to, everybody thinks it's like some prestigious high school, it's really not. [chuckles] It's a very fine school, but Baltimore, particularly North Baltimore, has a strange thing, partly because the public school system was really bad. It just has a culture of these private schools, and there's a handful of them, probably 8 to 10. The one I went to, I don't know how exactly this all came down, but it was sort of known as the school where kids have a little trouble academically. They don't do very well, but the school is kind of small in nature and they are good at getting the best out of the students or whatnot.

I went there when I was in kindergarten, I just formed all my friends there and I did pretty well in school. At different points my mom and dad were threatening to send me to a different school where they thought I'd be more challenged academically. But I liked it there, and all my friends were there, so I always rebelled against that. Classic upper-middle class white kid fashion, I got my way. Anyway, I had great experience there. I applied to all the colleges. I think I first wanted to get to Stanford or something I applied early there and got rejected. Long story short, I ended up getting a chance to go to UNC Chapel Hill, which is great.

The reason I went there is, it's a great school, obviously, but then I had a number of family members including my mom, my uncle, my grandfather all went there. There was a family history. Growing up, I had always wanted to go there among other places. I had the intention of pursuing or at least meeting the requirements for pre-med. I majored in chemistry with a biochemistry focus. At times I flirted with switching to mathematics because I was pretty good at that and really liked that. At times I flirted with doing graduate school for molecular biology or chemistry or something. Ultimately, my goal throughout still was geared towards medical school.

Barr: Any particular influential mentors from undergrad?

Keenan: Yes. I worked in a structural biology crystallography lab. I guess, there's two people to mention. First off, my mom. She knows everybody somehow in Baltimore. I think her last science class was probably in high school. She somehow, though, worked with a guy that was best friends with a researcher at Johns Hopkins named Solomon Snyder who is a very famous guy. He's one of the godfathers of modern biology. He won the Lasker award. A lot of people think he was one of the all times snubs from the Nobel Prize award. She somehow knew him through this connection and actually knew him pretty well. Our parents were getting invited to dinner parties at their house and that sort of thing.

I liked science, so she somehow coordinated with him and then he ended up basically coordinating the summer positions. So between my sophomore and junior year, I

went and worked in the lab, in Dr. Snyder's lab, which is a world famous neuroscience lab. Worked with a graduate student there, I started doing some research there, basic science research. That was a great experience. That turned me on to the whole basic science thing. At the time, I didn't appreciate what an amazing lab it was, I just thought every lab was like this. It was a huge lab. There's probably, between all the post docs and graduate students, there was probably 30 or 40 of them. Just a giant lab. They had all the resources, they had all the capabilities.

Looking back on it, it was really a pretty incredible summer experience. That perpetuated my interest in science, I then firmly made the decision to stick with chemistry and biochemistry rather than branch off into mathematics or something different. Then, when I got back and after that summer I linked up with a lab, the principal investigator was a Dr. Matthew Redinbo. He's still at UNC actually. He's had a really successful lab. They do structural biology and crystallography stuff, so I spent basically two years working in that lab. I really developed and I set up basic science skills there. I really enjoyed it, ended up getting included on one publication and still email with him from time to time. He was a recommendation for my NRSA. He was a good influence. He really wanted me to go to graduate school and not medical school. All of the other guys in basic science labs at that time, everybody wants to go to medical school. I think the professors sometimes view that as slight against what they do but obviously, that wasn't my intention. I consider him a key scientific mentor.

Barr: Did you take time between undergraduate and medical school or you go straight through?

Keenan: I did. I applied for medical school right out of college. I just didn't get in anywhere. I only got one interview at the University of Maryland, and I got waitlisted, and I didn't get in.

I ended up scrambling for a position at the NIH. They had this postbaccalaureate intramural research training award program. You apply for it. It's a nice thing to put on your CV these days. I don't know how competitive it is, because I think, essentially, there's a fund set aside to basically take on a recent undergrad that wants to do either medicine, or basic research in biology, chemistry, medicine, what have you. They had this fund of money there where investigators were allotted money to get one of these people.

After it became clear I wasn't going to get into medical school, the first go-around, anyway, I looked at the options and they seemed pretty good. I applied and a few people contacted me. I ended up choosing a lab for a principal investigator named Ashish Jane, who is actually now no longer at the NIH, but I don't know where he is. I haven't contacted him in a few years. I spent a year there at the NIH.

His lab was, basically, they had discovered a novel, genetic condition known as ectodermal dysplasia with immunodeficiency. Basically, it was these little kids that had a primary immunodeficiency. They identified mutations related to the gene known as known NEMO, or NFKB essential modulator. Gamma is another name for it. I was

involved in some basic science work relative to that disease and that signaling pathway. I spent a year there.

In retrospect, that was a great year. I lived in DC. I didn't have any responsibilities aside just showing up, doing a job that was pretty fun, and easy, and interesting. Then, going home. Having the weekends always to myself. Living alone. I had a bunch of friends in DC. I learned a lot. Got on a few publications from that lab and continued to develop a basic science skills repertoire.

Interestingly enough, somehow it came up, Dr. Kirk realized that-- I guess when he was reviewing my CV at some point --- realized that I had worked with Ash Jane. I think Dr. Kirk had left the NIH by the time I was there, but apparently, they were, basically, situated in a lab right next to each other. He was like, "I didn't realize you worked in Ash's lab." I said, "Yes, yes, I did."

Then, in the course of that process, I was reapplying to medical school. Actually, I was really interested in the research. I applied half and half, MD PhD programs and half just regular MD programs. This time around, I got a good number of interviews, probably seven or eight. Ended up getting into a few places. A couple MD PhD programs I think at Jefferson and Albert Einstein, and then, I think I got into Boston University and the University of Maryland.

I thought long and hard about the different options, but I ended up choosing just to go the MD routes at the University of Maryland. It was in Baltimore. It was my state school. Really good medical school and would have the in-state tuition advantage, and it was in Baltimore City, which my family was from. That made a lot of sense. I figured if I really wanted to do the research, I could address that later in either fellowship training, or elsewhere.

Barr: When in the course of medical school did you know that surgery was going to be your future? What made you attracted to that field?

Keenan: At the time I went to medical school, actually, that year at the NIH, I actually just read voraciously, all different things. That was the year I was the most educated on current events and was the most worldly person in the sense that I was reading literature, all this stuff, and then, I was working in this immunobiology lab. I had gotten really interested in the immune system. I went into medical school thinking, "I might go into infectious disease."

I approached it with a very open mind. I was thinking, "I'm going to go into internal medicine and specialize in infectious disease." That was my first thought, but I was very undecided. Surgery had not occurred to me. I went to medical school a little bit with a chip on my shoulder, too. I hadn't gotten into medical school the first time. I was getting there and just assuming I would be a bottom-end of the class guy since there had been a little bit of a struggle to get into medical school. I was like, "I'm just going to be really serious and work as hard as I can. I'll probably try to go into internal medicine and then, specialize in infectious disease."

At Maryland, we had a pretty traditional system for education. You spent the first two years in the classroom, just going to lectures, small group sessions. Then, you took step one at the end of the two years. Then, your third year was your clerkship rotations. I had set-up an internal medicine rotation first because that's what I thought I was going to want to do. I did that first and I was like, "Oh, boy. I don't think I want to do this."

I just found the pace of the day to be just very slow and the inpatient rounding stuff just was very slow. I didn't like the inaction, or the inactivity. We didn't really seem to do much on a day-to-day basis. Then, we also were always consulting out to other services for anything that ever needed to be done. I knew after that rotation that I didn't want to do internal medicine. I was like, "I guess I need to find something else to do." [laughs]

The next rotation I had right after that was surgery. 12 weeks on surgery. I still had this interest in the immune system and I'm on surgery. I had great experiences just on one of the general surgery services there. Actually, at one of their community hospitals known as Mercy that is a little bit like our Regional experience. Then, I had another great experience on the thoracic surgery service with one surgeon in particular, Richard Battafarano who has since have left and gone to Hopkins, actually. He was a good mentor for me.

The other thing is, we all rotate through Shock Trauma Center. You're just a little student there, but they have this thing called the Trauma Resuscitation Unit there which is basically 12 resus beds. It's a pretty wild system they have there. They've just got a great protocol with protocolized way of dealing with trauma patients. All the nurses, and the attendings, and fellows in particular, they really run traumas very efficiently.

They have all these residents from all over the place to come and rotate there to get their trauma experience. The systems work functions around the residents, to some degree. I remember just being blown away by some of the stuff I saw on that rotation. We do thoracotomies, emergency surgery, patients bleeding to death. I was just pretty inspired by the whole scene. After that, I was like, "I think I found something that's going to be good for me." That's when I knew I was going to do surgery.

Barr: When you went on the interview trail, what was the reputation of Duke surgery when you were talking to either mentors or other applicants?

Keenan: It's funny. I had done pretty well in medical school, towards the top of my class. I had good board scores and everything. All the faculty that I worked with, I did a couple of sub-I's. I did a trauma sub-I and I did a transplant sub-I. Still thinking heavily about transplant, or trauma, actually. Transplant because of my interest in immunology, and what not.

All the faculty really seemed to like me. I liked Maryland a lot. At least for the first half of my fourth year at medical school, I was just convinced that I'm just going to stay at

Maryland. I'm going to rank Maryland number one. I really liked it. They seemed to like me. It seemed like a great fit.

I was encouraged actually by Dr. Battafarano in particular and then Dr. Bartlett, Steven Bartlett was the chairman of Maryland at the time. I think he stepped down actually very recently for another position. A bunch of faculty were like, "Stay at Maryland, it'll be great." Actually the two of them went out of their way and said, if you want to stay at Maryland that's great but you're going to be competitive at the very best places and you really should give them a close look. I applied to all the "best places".

The places that they mentioned in particular were the Harvard programs and Penn and Duke. Both of them really mentioned Duke as a place I really needed to take a close look at and a few others, the typical suspects, Wash U, UCSF.

At the time I was thinking to myself well, I'm not sure I'm going to be too interested in Duke. I had gone to UNC Chapel Hill for undergrad and part of that process is you learn not to like Duke basketball and I was like I just don't really see that happening. Actually, the way the interview season played out for me, I got interviews basically everywhere except I hadn't heard from Duke. I was thinking to myself, "God, I can't believe I applied there, they're not even going to interview me, and I already don't like Duke."

Then I got a invite interview at the end of January or something, right at the end of the interview season and I was scheduled an interview at UCSF and then my wife and I were going to dovetail that to a trip out to the winemakers there. I was thinking to myself I'm just going to dump Duke. I've interviewed at a bunch of great places. I've got a rank list in my mind, and obviously I don't really see Duke surpassing a bunch of these places. So I told my wife I think I'm just going to decline this interview at Duke. She actually told me not to do that and I should interview there. I think she had sort of come around in her mind that she might actually want to be in more of a Durham-like setting where it's a little smaller city, a little bit more affordable.

Anyway, I ended up taking the interview. My wife still went to the wine vineyards with her sister, who took my spot. Anyway so I came here and interviewed. The reputation that Duke had was it was just a very austere place. It was a great place for surgical training. It was one of the best places but it was very austere, very buttoned up and everybody uses the term malignant when they're talking about a program like Duke, and that was the reputation it had.

I came down here with a pretty open mind and I certainly wanted them to, like every program, to like me and if I want to go there and have a chance of them actually ranking me high. I remember my interview here pretty well. Dr. Jacobs was the chairman at the time. He had a very welcoming demeanor. Dr. Clary was the program director and then he had this kind of a dry wit sense of humor that aligned with mine. I thought well, all these guys seem okay. I met a bunch of residents and went out to the dinner event and just remember thinking that the residents are pretty nice people.

I remember particularly meeting Judson Williams and Ryan Turley and Kerry Lunsford among others. They were all pretty welcoming and all spoke really highly of the place. Then there was also just this atmosphere of: we're a research place, we want you to spend two years, we want you to develop expertise, become someone who stands out in your field research so that you can take that on to the next place and I felt that they meant it. I was like, I think this is what I'm looking for. Because I wanted to get back into basic science and really pursue a career in academic surgery so lo and behold, that interview I almost didn't take for the school that was my undergraduate's rival, I ended up deciding this is where I want to come. I was able to match here and it all worked out.

Barr: What year did you start at Duke and who was in your intern class when you began, the categoricals?

Keenan: I started in 2011, July of 2011 and our intern class included Danny Nussbaum, Brian Gulack, Jeff Yang, Cameron McCoy, Hang Hang Wang and then a person by the name of Emma and myself. We were the categoricals. There was a number of non-designated people as well. There was Mike Galanos who spent a couple of years with us and then matched in an integrated cardio thoracic spot in Kentucky. There was George Kokosis who earned a categorical spot starting his PGY-2 year and then didn't do any research years and so graduated a couple of years ahead of us and then, trying to think who the others are.¹ There's a guy named Amiro, I can't remember his last name but he ended up matching in ophthalmology at Duke. Then there was a guy named Danesh. I can't think of his last name either but he ended up being asked to leave the program before the end of the year so that wasn't as successful.

Barr: Any good stories from intern year that exemplify your experience?

Keenan: There's a hundred different good stories. I think it's interesting now, seven years ago I can't tell whether it was a short time ago or a long time ago that I was an intern but I became pretty good friends with our class. Emma left the program within a couple months. All the rest of us got along. We got along with her too, she just wasn't a good fit, I don't think. We became good friends, we made it through the trials of intern year together. I was particularly close with Danny and Brian, still am.

Let me think about some good stories our intern year. There's one story I always come back to, whenever I'm thinking about this and I've almost even thought about telling a little bit during the chief's dinner but I probably won't because it's a little drawn out. It's tough to give it the proper context in that setting.

You can probably relate to a story like this. It's towards the end of the year and we've come into the period of intern apathy where you can do the job pretty well and actually the biggest hazard of patient safety is actually us not being attentive, being apathetic because we're tired of being interns and whatnot. There was a faculty member that's

¹ Editor note: Kokosis did two years of research before starting as a preliminary PGY-1 and earning a categorical spot.

no longer here by the name of Scott Pruitt. They didn't have any acute care service then so general surgeons just rotated call days, and whatever came in that day they got and they dealt with. Dr. Pruitt was largely a melanoma and breast surgeon and he actually had a big research program in melanoma and I think he since left because he was recruited by Merck to go be involved in their drug development.

Dr Pruitt was known -- despite having what was otherwise an elective melanoma and breast practice -- he was just known, for whatever reason he got these- when he was on call just these utter disasters would come. It had gotten to the point where it was beyond just a few bad call days. Everybody knew when Pruitt was on, then it was going to be just a disastrous call day.

That's what apparently happened. There was some horribly mentally ill gentleman with schizophrenia who was living in a psychotic ward and he had started eating a bunch of sharp objects and he had basically eaten, ingested a bunch of sharp objects and then perfed his stomach. Dr. Pruitt got called, they basically did an ex-lap, they fished everything he had eaten out and closed up his stomach. That part of it actually went reasonably well, but then he was just in this terrible psychotic episode and he was recovering down on 2300. He develops a wound infection so he has a wound vac and this guy is just like-- I don't think I've ever seen since then a more psychotically ill person on one of the general surgery floors.

This guy was in four-point restraints for weeks. He had this wound vac on and any time anybody was in that room he would chant, "Death row, death row, death row, death row," and then all of a sudden he'd look up and he'd go, "Put a bullet right through my brain." He'd be shouting this, he'd be in a chant mode. There'd be a sitter who would not go in the room, so she would just sit outside the door and no one's going in the room.

The problem we were running into was being in four-point restraints, psychiatry was following and he was getting IM injections with Haldol and all these other stuff to try to keep him down. Intermediately his sedation would be good and he'd be coming out of it and he'd be in these four-point restraints. He would literally, somehow get dressings or something on his body and then eat them. He kept doing this.

Anyway, I happened to be the night intern when this was going on, on the general surgery services, so I'm walking by every night, just carefully walking by the room and peering in. Anyway, at the time there was a silver service which may come back actually next year apparently, but that was like breast-melanoma-endocrine, sort of the small surg-onc stuff. It was like a sweet intern rotation because there were never any inpatients. You got posted to these small, wide, local exclusions which were fun. Nussbaum was the silver intern. It's towards the end of the year, May. I'm coming in to get sign out from Nussbaum. He's got his feet kicked up on the 2100 workroom and he's like, "Jeff, this silver intern is the easiest. I spent all day in the OR and I didn't do a single bit of intern work. It was so easy and all the patients are doing fine." [laughs] Then I'm looking at the list and he's going through it with me, he's like, "Nothing to do. Nothing to do. Nothing to do."

Then he gets down to our friend, the poor psychotic gentleman that keeps eating stuff and he goes, "Oh shoot, I was supposed to change his wound vac today," and he goes, "Anyway, I'll just change it tomorrow, don't worry about it," and he leaves. Then basically five minutes later I get a page from the nurse saying, "Mr. so-and-so has ripped off his wound vac and he's trying to eat it-- It's lost suction. This wound vac has lost suction and we need to-- It's beeping and it's agitating him and he's flipping out." I'm like, [sighs]. I have to go. The long story short, I have to go in and change the wound vac while this guy is chanting, "Death row, death row, death row." That's classic intern story with Nussbaum neglecting his intern chores.

Barr: Some things change more than others. What have you been doing your research on during these two years of your residency?

Keenan: At the time I was interested most in trauma and critical care. I was poking around and trying to figure out where-- I want to do something about basic science primarily, and as I asked around. At the time we didn't really have a basic science trauma lab. None of our critical care people really were active in basic science research there but they referred me to one of the pulmonology faculty, Dr. Claude Piantadoci who's had a longstanding lab that basically looks at oxidative stress, redox regulation and has done a lot whole of work in oxygen metabolism and mitochondria.

He had this sepsis mouse model, that's what I was thinking I would work on. I went to him, I met him a few times and ended up being able to set up a research fellowship with him. I wrote an NRSA for his lab and got that funded. I ended up doing something a little different primarily. He had these novel conditional transgenic mice that specifically knocked out these genes that are key in regulating a pathway to this mitochondria biogenesis or through a genetic program by which when a cell or tissue is injured, how that cellular tissue goes about replenishing its mitochondrial mass to meet its energetic requirements.

A couple of these mice, but one, in particular, I ended up working on that was conditionally knocked out in the heart for a gene called Nuclear Respiratory Factor 1. I spent most of my time in the lab characterizing this novel mouse, what happened after we knocked the gene out. A lot of good work came from that. I'm still working on getting that first paper published but hopefully, it'll be published in the next few years.

I was involved in a couple other couple of side projects there. It was a really good experience, I still have an association with the lab. I'm hoping to carry some of that work on to help propel an interest in cardiac surgery and I'm hoping to carry that work on to some of the stuff that I'll clinically be involved with.

Barr: How did you transition from an interest primarily in trauma and critical care to more cardiac focused?

Keenan: The lab experience was part of it. Part of it was, we had that rotation in our second year in the CT ICUs. I spent a couple of months up there. There was just a few patients up there that I remember being blown away by...Basically, they were on the brink or were dead. Somehow, through ECMO surgery, whatnot, they got through

it, and so that whole process inspired me a little bit. Then I ended up going into Claude's lab, ended up spending all of my time thinking about heart failure and cardiac myopathies. That spurred an interest or perpetuated an interest there.

In research lab, that was a time period where we were voraciously getting involved in clinical projects as well. Nick Anderson was one of the residents that I worked with clinically and looked at as a role model. He had done a lot of work with Dr. [Chad] Hughes' research group and he somewhere between coerced and convinced me to go work with Dr. Hughes in his lab.

I've also, dating back to the CT ICU experience, developed an interest in ECMO. That actually aligned really well with Claude's lab and oxygen metabolism and energy metabolism. A confluence of those things just led me to think, "This is what I'm spending all my time thinking and studying about, it's what I'm interested in. I guess I really should do this for a career." I still had some interest in trauma and critical care but as the interest was growing in cardiothoracic surgery it just made a lot more sense to go that way.

Barr: You matriculated into the 4-3 integrated pathway. Can you describe a little bit about what that is and how that affected your residency?

Keenan: Yes, sure. At the time that I applied, there was at least six or seven people who had gone that pathway before. It had been established at that point. I was a little different because all the other people that had gone into that program came onto campus, day one, going into CT surgery, developing relationships with Dr. [Peter] Smith and Dr. [Thomas] D'Amico. They were on that track from the get to and I merged into it, probably my PGY four year, my second year in the lab, that set my mind firmly in that direction.

Coming out of the lab, In our SAR-1 year, the process had been formalized enough that there was actually an application process. I prepared the application, wrote the personal statement, got letters of recommendation. I had declared my interest at this point to Dr. D'Amico and Dr. Smith and whatnot, and so I applied in the middle of my SAR-1 year. Thankfully I was able to secure a spot there. The way the program works right now, you finish up your SAR one year then you go into the program. Roughly, they sort of measured out that you spend about half of your last two years on CT services and that's sort of true. You spend some of that at the VA thoracic and some of it on the Duke vascular service which you would have done anyway. It probably ends up being about eight months that are truly different than what you would get on the general surgery side, but it has affected it.

SAR two year, not so much. SAR-2 years basically are the same year as everybody else except you spend two months on general cardiac service. The CT program is still figuring out how to deal with that a little bit because they're getting people that are SAR-2 and they've been used to having people who have completed the general surgery residency. I was on service with Jack Haney and Mani Daneshmond for two months and it was just a great experience. Jack Haney, in particular, is just incredibly

a patient and gifted educator operatively. It's just great to work with him in patient care also.

It's good to work with Dr. Daneshmond as well, although we have less contact with him because he's got far fewer general cardiac patients. The heart failure patients get handled by the advanced fellows. I spend most of my time with Dr. Haney and that was really challenging. I mean, these patients are super sick and you're overwhelmed. I can say that I go back on their services and still feel overwhelmed, but it's a process every day to get better. The surgeries are really challenging. It's a tough thing to learn how to do. But aside from those two rotations, those are just really high-level, a high degree of difficulty cases, you can become a much better surgeon in that process.

I finished out my SAR-2 year. This year has definitely been a lot different compared to my fellow chiefs. I spent six months on CT services, three of those months were on the congenital service. Then all the while you're also the little peon in the CT groups. You've got your senior fellows and your mid-level fellows and you're definitely the low-rung guy. That's fine, everybody has got to do that but it's in stark contrast to when you're on the general surgery services and you're the chief resident and you're at the top of the pyramid. On the CT side, you're taking the 3333 consult pager, you just got mountains of work in front of you every day and there's definitely no one that you can delegate to. You're the one that gets delegated. That's a challenging part of it.

The general surgery side, spent two months at the VA function as general surgery chief which is long tradition in our residency. Still is a really great rotation and this year we worked primarily with Dr. Barbas, Dr. Novick. Dr. Moore and Dr. Mosca is heading up general surgery[at the VA] right now. They've actually done a nice job at the time of my residency sort of regaining control of the VA. It's a challenging system to work in in a lot of regards, but they made a good chief experience where I don't think it was five to seven years ago where we are doing a reasonable volume, pretty good complexity cases and really being the primary managers of those patients. So those were great experiences.

When I came back over to Duke for the general surgery rotations in the spring here, I spent most of the time on the hepatobiliary and colorectal services as a chief. One thing we miss out on or I missed out on a little bit this year since I spend half my time on the CT [were the hepatobiliary and colorectal services]. Those are really money rotations because you are doing these big cases with these great surgeons that you're learning from. You're really learning a lot operatively. But in comparison to the CT side, the stress of patient management is far less, and then you also have underlings. You have interns and junior residents that help you out and allow you to focus on just the operative side of the patient management side of things. I feel like I missed out on some portion of the experience where it's the sweetest in the general surgery training, but the same time it will shorten up training by a year and I certainly got some great in general surgery rotations.

Barr: In the course of your time here the chairperson has changed from, Dr. Jacobs and Dr. Kirk. What changes have you seen Dr. Kirk bring to the program?

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Keenan: Well, it's funny because one of the questions applicants we're interviewing always ask is, "Well, what's the stability in the program, and do you see there being stability at the program director position and the chairman position?" That was always the question I asked just because it seemed like a reasonable enough question and you've got to have something to ask as you're going through 15 interviews or whatever. I showed up and I remember being impressed. I thought Dr. Jacobs had a lot of energy and I really was attracted at the atmosphere that he conveyed and the atmosphere that the department put forth.

Dr. Clary really struck a chord with me as well, and then, of course, literally before the end of my intern year, Dr. Clary stepped down as the program director and early into my jar year, Dr. Jacobs stepped down as the chairperson. Really, my experience with them was almost limited to my intern year. My intern year was much more shaped by chief residents than anything else, there are so many layers above you, you don't even think about the chairman. We changed quickly and Dr. [John] Migaly was named the program director. He's been the program director since my JAR year.

Then we had this big chair search and Dr. [Ted] Pappas was the interim for probably, I don't know how long it actually was, but probably 18 months at least. Of course Dr. Pappas has been here forever, ones of the godfathers of the department really. He held down the fort. One of the interesting things is we got to participate-- It was really during my research years the chair search was full blown -- and we got to participate with that process any time we were bringing in a chair candidate. We were the ones picking them up. We were the ones touring them around the facility. We were the ones-- we'd meet with them and show them some of the research stuff we were working on and so on and so forth. I personally met probably three or four of the people that were interviewing. Interestingly enough, somehow, some way we dropped the ball, research residents did, when Dr. Kirk came. We were supposed to have lunch with them and just whoever was in charge of that just did not pull it together and basically, he showed up for lunch and there was nobody there.

Actually, Dr. Pappas -- at the time we had a basketball game that was organized by me and Danny Nussbaum and we played every Sunday. Dr. Pappas actually came pretty regularly and he pulled me aside, I guess, the Sunday after this had occurred and he goes, "Jeff, Dr. Kirk came to interview on Wednesday and he was supposed to have lunch and a tour with all of the research residents and nobody showed up." I go, "Huh, is that right?" He was, "Could you just make sure that doesn't happen again." I'm like, "Yes, no problem." He's said, "Dr. Kirk is a Duke guy. It's not that we can't we can smooth it over with him, but the other candidates, it's not going to be as easily smoothed over." I was like, "Okay, we'll avoid that."

So anyway, so it was interesting to partake in that and so actually we all knew the other candidates, but none of us had met Dr. Kirk, interestingly enough. You start hear rumblings on they like Dr Kirk for the chairmanship. We didn't know what that meant but he was named the chairperson, must have been right as I was-- When was he named chairperson? He might have been named chairperson actually, I guess it must have been right in the middle of my research period. We had a year, at least a

half year, we were still in the lab with him. Then, we obviously spent the senior clinical years with him as the chairperson.

Anyway, a couple of things that I would say, he's definitely reinvigorated the place a good bit. When we were shifting between chairmen, there seemed to be a lot of rumblings amongst the faculty in particular for how costly the research fellowship was since to a large degree that was funded by the department. We haven't done quite as good a job collectively getting outside funding for our research. There was definitely a movement within the faculty to do away with the funding of the research experience. There is also an atmosphere in general where the residency program seemed to have lost some standing within the function of the department. There didn't seem to be as much engagement amongst the faculty.

Anyway, that all changed and went away when Dr Kirk came. He made it clear right from the get-go, he was like, "No, this is central to the core of the mission. The residency is fundamental to our mission. Our research component residency is fundamental and that's what we do." That sort of tone was set early and it's persisted. Like I said, I didn't have a whole lot of interface with Dr. Jacobs but I certainly feel Dr. Kirk is much more involved in the day to day with the residents than perhaps, Dr. Jacobs was. That makes a big difference. I mean, he does Kirk rounds, he does the Friday conferences, but particularly the chief year, when you're admin chief when you're with him every day for half hour, tells you you're not doing a good job spelling when you send out the email. Just incredible attention to detail but that's his mentorship and guidance.

He gives half an hour of his time of day to day to the administrative chief resident and every Friday he meets with all of us. It's how he keeps eyes and ears out on the residency program. He really wants us to develop into leaders, so he's put that effort forth. He's definitely made the research component, he's re-centralized that. The expectation is just much different. Another point, just with Dr. Migaly. Dr. Migaly has also done a very good job with the program directorship. He's been an advocate for residents. There was a feeling, previously, that when you're a resident you just need to shut up and get the job done. You complain under no circumstances. Dr. Migaly has advocated for residents when he feels residents were given short end of the stick, or were not being treated appropriately or not getting a good educational experience.

I don't think it's been visible to a lot of people. You get more of it when you're a chief resident, but those are not arguments or battles that are won easily. He has to go out there for us. Previously, we had a dip in our board passage rate which is just incredible that that was ever a problem here. But now four years a row, we have had everybody pass on the first try. My class will have to try to make that five. The pressure's on for us.

Barr: Who do you see as your mentors throughout the residency process?

Keenan: Good question. I've got good relationship with a bunch of faculty. Some ways, I feel I maybe have not done the best job sort of having one or two go-to mentors. Claude obviously is my research mentor. He's been very impactful there but

File name: Keenan Interview May2018.m4a

he's not surgery faculty. I would say, overall, I spent a lot of time with Dr. Hughes doing research. He was instrumental in helping me get into the CT program, particularly as I was a later comer there.

On the general surgery side, Dr. [Chris] Mantyh has been a good mentor for me. Did a research projects with him and I worked with him on a couple of rotations clinically, I've learned a lot. His organizational and his approach to things. He's very nuts and bolts down to business does not mess around with superfluous stuff, and I definitely try to learn from that.

Dr. Migaly has been absolutely a key mentor, not only as a program director but someone who has me work through problems and his approach to doing that. Dr. Pappas has had a good impact, I've developed a pretty good relationship with him. It's incredible that he comes every Saturday to the VA, early Saturday, between 7:30 and 8. He runs through all the patients with the chief resident. When you're the chief resident, it's really important because otherwise you're probably not getting much guidance on a day to day basis. You go through your patients with him, bounce your ideas off him. That's incredible that he does that.

Dr. Kirk has a good impact, working with him as administrative chief resident for a couple of months. Like I said, he does give you that time. Going back to the CT side, Jack Haney was a key clinical mentor. Dr. [Carmelo] Milano and Dr. [Jacob] Schroder, I was on their service earlier and they're also very good clinical mentors. Then the leadership there, Dr. D'Amico Dr. Smith have also taken an interest in ushering me and others along.

I forgot for a moment about the vascular people. How can I forget about them? Dr. [Ellen] Dillavou was absolutely a key mentor and surgical teacher with our SAR one experience at DRH, doing vascular anastomoses with her. If I hadn't had her rotation before the cardiac rotation, it would have been very bad indeed. She was key and the other vascular people, particularly Dr. [Mitch] Cox keeps the OR fun and has helped give me a lot of confidence as a surgeon also. You just got to stick with it and get the job done. Bunch of faculty members are key roles models in my development.

Barr: Are there any obvious ways that you see that surgery can improve for the next generations those coming in as interns?

Keenan: It's changing, things are always changing and maybe we just got some hubris about moment but things have changed a lot for the last seven years and continuing more so than ever. The increasing sub-specialization of everything and the semi-desire for training programs to try to get people into specific training tracks earlier has a big impact on the residency and a big impact on the Duke culture. The Duke culture's always started with you learn everything. You can be a surgeon for everything. That no longer is realistic because we've gotten too complicated with our sub-specialization.

One of the things that will be interesting to see how it develops and how Duke responds to it also in their training, is protecting the general surgery residents and

their training. I'm really going to be proud to finish as a general surgery resident here I'll sit for the general surgery boards and everything. But there are people nipping at that core tradition in different ways. No one's doing it maliciously but it's something that has to be protected. I still think that type of general training and global training makes you a better doctor than you could be otherwise. Better doctor, better surgeon. That's going to be something that the residency and leadership within the residency is really going to have to hold on and push back against.

Our program is sort of interesting now because we have our core residents and that shrinks over time. The people you're with at the end are much smaller not because we're lopping people off but because when you're an intern and junior resident, you've got all these sub specialties, the plastics and the vascular people, the PA residents and the non designated interns.

Those people go away and you end up with a much tighter, smaller group at the end. To some degree that has led to-- since the junior years are more expansive -- it's led to less continuity or ability to foster that global training from intern to chief resident. It's diminished the accountability for that. We will have some new residents that begin to start to step into that SAR one role who will be a little less prepared in that regard.

It can be retaught at that time and I'm not sure how to improve it. That's what I would focus on if I were in leadership. Trying to figure out how to hold on to that, when there's all these forces pulling in different ways and make sure you're streamlining those people who are going to be finishing as chiefs, that they understand that it's point A to point B. It's not supposed to be muddled up in this part.

I think that residency, otherwise, they're improving it in a lot of ways. The culture and the feeling of the residency, I just think it's much better than it was when I was an intern, honestly. When I was an intern, it was typical for even a minor thing to have a public dressing down of a resident. And reminds me of a story, our intern year, my co-resident, won't name his name, but there was a chief resident that had been particularly hard on him. And so we're joking-- he comes into the 2100 workroom and one of my co-interns says to this intern who just now get roughed up pretty well a short time previously, and goes, "Oh, DaRossa looking for you." And he goes, "Ugh, not again."

That was typical of the culture. There was a-- definitely as an intern Junior resident, public lashings or bites were very frequent and typical. There was also this perception of hierarchy. As an intern, I walked into the bunker one time, it was a very intimidating experience for me because it was very clear I wasn't welcome. I would hear about it too, even if I had been asked. I was asked to come into the bunker to review some data with one particular senior resident.

That led to others in the room saying, why are you here? I don't think there was the same amount of friendliness in the residency and maybe my perception is just now I'm the chief resident. I barely know what it's like to be a little guy amongst the residents, but it's very unusual for there to be public reprimands. I don't see it very

often. It's much more handled on a professional matter. Could be wrong about that but that's my perception. There's just much easier cross-talk between the levels.

These days the JARs, we sit right with them at the bunker as they're getting their 2222 consults, almost looking over their shoulder and saying, "what do you got going on there?" chatting about it. That part of it is much improved.

Dr. Kirk says he wants to make it the whole training process more humanitarian. And I think in some ways it has young more humanitarian. We're going to have to do that while also holding on to the traditions in our training that have made the training excellent. It's just unfortunately just hard to learn how to become a surgeon and especially when we try to train the best. We're trying to do it at a very high level.

Barr: On a personal level, you and your wife had a few kids while you're resident?

Keenan: Just one actually although my wife is pregnant with triplets.

Barr: Congratulations.

Keenan: Yes, there will be some more....

Barr: How is it like to be a husband and a father while pursuing this arduous training?

Keenan: Well it's tough. Coming up on my 10th wedding anniversary. We've been married a long time for someone my age. Interesting, I think about it now at the end of seven years when we moved down here, we'd been married for a few years. Now we've definitely spent much more time married as a Duke resident couple than we were beforehand. I'm fortunate I have a great wife that for the most part has been tolerant of the training and demands on training.

I'm probably worse than most in the sense that something has to be very serious to take precedence over the work. Basically, there's got to be a serious health issue or some other serious event that would take me away from my obligations at work. She's dealt with that and she's dealt with that really well and I think she still likes me.

We had our son Quinn in the middle of the research years. He was born in November of my second research year. That wasn't that hard. Actually, I went to the lab the next day, it was more so that I could just go and do something enjoyable and get out of the house for a bit, but it was pretty easy in the research years. If you needed to take a little time or show up late, it wasn't a big deal. You work on your own schedule and you have a new baby. You just take a little time spend it with the baby, spend it with your wife.

Obviously, things changed when I went back onto the clinical side of things. I was away much more and the schedule was not my own. Somehow my wife dealt with it. She worked at a pretty high-intensity job also until she recently left it this fall. And somehow she coordinated with the nannies. We shared a nanny with the kids down the street and she's got them all set up in the pre-school.

In some ways, I'm sort of a bystander in the process, unfortunately, but it's great to have a family to come home to. The setting of a Duke is really conducive to that. We live just five-six-minute drive from the hospital. We live in a three-bedroom house in nice neighborhood. They seem happy. So it can be navigated. Now, like I said, a lot of it has fallen on my wife and she's handled it very well. Other people, situations are not the same. It's definitely not easy to have a kid in residency. I'm willing to guess it will not be easy to have four kids in residency. I'll let you know how that goes.

Barr: As a last question. How do you see your career unfolding after you complete the cardiothoracic fellowship here at Duke?

Keenan: My intention is still to go into academic surgery. I will see what happens. I would love to carry on research surrounding the work I was involved with in Claude's lab, oxygen metabolism, mitochondrial health and genetic regulation, mitochondrial biogenesis as they relate to advanced heart failure patients and somehow carve out a way to look at that question amongst those patients. I plan to stay in academic medicine and we'll see what happens the next couple years. If an opportunity came about here, I certainly would think hard about it. If it doesn't, I'll look elsewhere and hopefully something will line up.

Barr: Thank you very much for your time. I really appreciate it.

Keenan: All right. Thank you Justin.

[01:10:05] [END OF AUDIO]