Pioneer Perfusionist Interview: Gary Grist 1/13/2025

Al Stammers: Good day everybody. My name is Al Stammers, and I have the pleasure of continuing the AmSECT Perfusion Pioneer interview series. Today is January 13, 2025, and we have an absolute true pioneering individual who's been involved in perfusion for several, almost five decades, if not longer. And that individual, Mr. Gary Grist is, of course, well known to all of us. ~~And~~ Gary has a phenomenal background that we're going to get into his perfusion experiences and ask him about many aspects of his career. But before we start with perfusionist-types of questions, I'd like to have Gary give us a little bit of about his life in the pre-perfusion years. It's always interesting to hear from individuals of what they did in their high school days before they went to college or university. So, Gary, again, thank you so much for agreeing to this interview today. And I'd like to begin by asking you, can you tell us a little bit about yourself, for example, where you grew up and what your early years were like and what were some of your interests before you entered college?

Gary Grist: Well, I grew up in Kansas City, Missouri. I went to Southwest High School in Kansas City. It was a good high school~~,~~ I got interested in biology there. When I was a senior in high school, I got a job as a part-time orderly at St. Luke's Hospital here in Kansas City, Missouri. And that was a really tough job. They ran my ass off. That job involved moving a lot of people and helping with people in traction, and I had primary care for seven patients every day when I was working there. Plus, they pulled me all over the hospital to do all other kinds of things like putting Foleys into the men and helping patients in and out of traction and that kind of stuff. It was a lot of work. I got tired of working so hard. So, I started looking for another job, and there was a newspaper ad from the same hospital for a Special Technical Services technician. So, I answered that ad. I didn't know what a Special Technical Service technician was, but the ad didn't say I had to have any experience. So, when I was 18 years-old, I applied and got that job. And that started me off on my perfusion career. I had a couple of hiccups along the way, but that started me in Special Technical Services which was a new division of the hospital where they were hiring technicians to do all kinds of things, including running the open-heart pump. I also performed hemodialysis on patients. I learned to operate the hyperbaric unit. I Learned to do EEGs, I learned to do EKGs, and I even worked in a GI lab. The only thing I didn't like was the GI lab. I pulled up this photo background for today's interview because this was taken by Dr. Denton Cooley for an article he wrote about doing heart surgery in the 1960s, which is when I started in 1968. So, if I can show you this Operating Room scene, there's a table, and you can see there's a lot of donor blood on that table waiting to be used. And if you look above that open-heart pump, there are four units of blood running in to prime the pump. And if you look at the perfusionist here, she doesn't have any personal protective gear on. No gloves, no warmup jackets to cover her sleeves, and no eye protection. I don't know what kind of pump that was. I think it's an American Optical, but I'm not sure, and there is a disc oxygenator, which is what I used to use. And another important thing to point out in here is this—you can see back there in the background, there's a glass bottle. All the IVs had these glass bottles, and those IVs caused a lot of damage, not in the OR so much, but in patients in general because the bottles had an air siphon in them. So, if the

bottle ran dry, the patient got a big air embolus, and it hurt a lot of patients and killed some patients, too, but not in the OR, because we were always watching them. But when they were out on the floors, they were that way. So, this is what my operating room would look like when I started working back in 1968. And that's why I brought the photo up, just to set the mood. So that's how I got started in this and that was my early education. Initially I wanted to be an oceanographer because I was really infatuated with the Jacques Cousteau stuff. But I decided that I couldn't afford to go to La Jolla or to Woods Hole universities. I didn't have enough money, so I had to stay in Kansas City. So, I worked at this job at St. Luke's for several years, learning to do all these things, these open-heart procedures, the hemodialysis procedures, and other things. I had a really good mentor, a guy named Jerry Swett, who was an ex-Marine corpsman who somehow learned all this stuff. I don't know where he learned it, but he taught it to me, and he was kind of my mentor when I first started. So at first, I didn't know what I wanted to do, and then I decided I kind of wanted to stay with this perfusion business. And so that's how I got started in St. Luke's. And after that, I worked there for three years, from 1968 to 1972. And then for two years I went to work for a hemodialysis company. They hired me to set up and train nurses with their hemodialysis machines. I set up hemodialysis units all over the country. I traveled for two years. That was a fun job, and I liked doing that. I liked meeting all the new people. This was hard on my family because I was gone for sometimes five nights a week. So, I quit that job after two years, went back to work at St. Luke's Hospital, and I worked there for about a year Then I got serum hepatitis. My eyes were yellow, and my stools were white for nine months. I was pretty sick. I thought I might die, and I was pretty sure it was going to end my career. Incidentally, see all the blood units on the table there (in the photo)? Every fifth donor unit was contaminated with serum hepatitis. That was the frequency that patients got hepatitis from blood transfusions back then. They can test for that now, but they couldn't test for it back then. And so, I had to leave my career, I had to leave the job in 1975. And I thought my perfusion career was over. Then I went to work in the real estate business, and I did fine until they started raising mortgage rates to 18%. You can't sell many houses when the mortgage rate is 18%. So, I started looking for another job, and I saw an ad in the newspaper from the local children's hospital. They were looking for a clinical perfusionist, and I said, “Hey, I can do that.” And so, I applied for that job, and I got hired on that job. That's how I got started.

Al Stammers: Great. Let's go back though and talk a little bit about your education before we get into perfusion, Gary.

Gary Grist: Okay.

Al Stammers: So, as you said, you graduated from the University of Missouri, and you had a Bachelor of Science degree. And was this in oceanography or was it something in the biological sciences?

Gary Grist: Just in biology. Biology with a minor in chemistry.

Al Stammers: Gotch. And you weren't planning on medical school, you were saying you were going to the ocean. And obviously in Kansas City, there are not many oceans close by. So going to the coast was your only option.

Gary Grist: Well, when I started that's what I wanted to do. But after I worked at St. Luke's in perfusion for a while, I decided that that's what I wanted to do. I didn't have the grades, and I didn't have the money to go to medical school. So, I thought I wanted to do something that would make a difference in people's lives, not just study octopus, but to actually do something to help people. I thought perfusion was an exciting, interesting way to do it. And it was a new science. 1968 may seem like it's pretty old since 1953, but it was still new science. We didn't really know what the hell we were doing, and we just did our best. Jerry Swett, who was teaching me, did his best to teach me about safety. Anyway, I got a degree in biology and then in the mid-1980s I got my nursing degree. I went back and got a nursing degree because at that time, when you worked in healthcare, nurses ran the healthcare system. So, if you didn't have an RN, people didn't pay much attention to you. So, I decided to get an RN, and I did that.

Al Stammers: So, Gary, thank you. And as we continue with your education, we know you've been a practicing perfusionist since the late 1960s, but I see that you went to perfusion school, you went up to Portland and went to St. Vincent's Hospital and Medical Center, and that was in 1991. And I wonder why? I believe you might have already been a certified perfusionist.

Gary Grist: I wasn't certified.

Al Stammers: Oh.

Gary Grist: I was not certified at that point, and I decided in 1990 that I needed to go ahead and get certified. I missed the deadline for the grandfathering because I was sick with hepatitis. I missed the grandfathering thing that the American Board of Cardiovascular Perfusion offered. So, after I went back to work as a perfusionist, I decided I needed to go ahead and get certified, and I managed to get into an abbreviated program up in Portland, Oregon. Greg Meiling was the director, and he was kind enough to invite me and said I could do cases all day and then go to classes at night. I got out in six months.

Al Stammers: Was Dr. Albert Starr still practicing at that time?

Gary Grist: Yes, and I did many cases for Dr. Starr. He kind of amazed me. I mean, I was awestruck by him. He invented… he said he invented the artificial heart valve. He did invent the earliest ones, but he was great. But he was so slow for a famous heart surgeon. I thought, man, you are so slow. I don't mean to disparage him. He's not with us anymore. But he was a great person. He was very nice. He was wonderful, and he lectured us in the classes. I liked Dr. Starr.

Al Stammers: Now, Gary, let's follow that for a little bit because obviously very few of us who got the breadth of experience that you have and the years as a perfusionist, if you actually do the math, you're well over 50 years. I really don't think you're retired from perfusion. All that you've done in the years after you left the clinic you are probably busier than when you were as a practicing perfusionist. But the question I have for you is over those years, during the formative years of cardiac surgery and cardiopulmonary bypass, you must have met some very prominent physicians as well as perfusionists. Let's start with the physicians. Can you tell us others that you may have heard at meetings, obviously who are no longer with us besides Dr. Starr? And then I'll ask you about perfusionists.

Gary Grist: Well, I met Dr. Cooley at a meeting, and he was a nice gentleman. I heard a lot of stories about him from other perfusionists, but I never did any work with him. And I also met Dr. DeBakey. He was kind of an impressive guy, very serious. I met him, but I never did pump any cases for him. But I met those two surgeons. The two I really loved were the ones I worked for when I started at Children's, which were Drs. Thomas Holder and Keith Ashcraft. They weren't well-known as heart surgeons. They both trained at Great Ormond Street in England, but they were world-renowned as pediatric general surgeons who also did heart surgery. So those are two I really liked. I pumped cases for Dr. Reed in Kansas City and two other surgeons who are not well known—namely, Drs. Henry and Graham at St. Luke's. I pumped cases for them. So those are the ones who I came in contact with that I knew the best.

Al Stammers: Yes, clearly some very, very prominent surgeons well known to all of us. Now let's talk about perfusionists, because back in the 1960s and 1970s, there probably weren't a lot of opportunities to go to meetings as there are today. As we know, AmSECT began, of course, and that was out there. I don't think the American Academy was up at the time in the 1960s, but correct me if I'm wrong. Who are some of the prominent perfusionists that you had the opportunity to meet, speak with, or share ideas back in the 1960s and 1970s?

Gary Grist: Well, I didn't go to a lot of meetings, so I didn't meet a lot of people. I met Charlie Reed. And let's see, Thomas Muziani, Kelly Hedlund, Stephen Peterson, David Holt, and Eileen Heller-Standing. Those are some of the people that I've been in contact with and have met over the years. So, I'm probably in contact with Kelly more than anybody. He's probably the most prominent historian for perfusion there is. But I didn't go to a lot of meetings, so I didn't get a chance to meet many perfusionists. I was doing so much work at the hospital, and I couldn't get away. They just wouldn't let me go, and they never wanted to pay for it. So, I would have had to pay for it out of my pocket. So, in the 1960s and 1970s, I didn't go very many places.

Al Stammers: Right, and that was pretty normal back then. And the individuals who you've named are well known again to all of us in the field and are very prominent as you are. I want to shift and talk about your RN. You told us you went back and got your RN degree in 1987 and obviously you've won awards for outstanding nursing throughout your career. Can you tell us, how having been a Registered Nurse assisted

you to become a better perfusionist? Or how does that improve your knowledge and experiences above and beyond what a normal, say Certified Clinical Perfusionist, who wasn't a nurse would have had?

Gary Grist: I think over the years there's been some animosity between perfusionists and nurses in the operating room. It might be just a rumor, but I've heard that before. Where I worked, the perfusionists were under the nursing department and so we had to more or less take orders from the nurses and the director of nursing. So, I thought that by becoming a nurse I could fit in better and participate in other things. Plus, I could do other things that non-nurses are not allowed to do. For example, I could circulate during surgery, and I could scrub in during surgery. I got involved with sickle cell patients. I had a sickle cell transfusion clinic that I did two days a week for four years. And then I got started into ECMO. I didn't have to be a nurse to start an ECMO program, but it helped to be part of that consortium that was made up primarily of nurses. Plus, I liked doing the other things that nurses do. I liked to take care of patients and help them as best as I could instead of just sitting behind a pump all day long.

Al Stammers: Interesting. Now, before we get into your years at Children's Mercy Hospital in Kansas City, you mentioned that you used to scrub and circulate and run the pump. Were there any days where you were actually doing two of those or three of those? I have heard stories where a perfusionist would scrub in and take vein and then go and operate the heart-lung machine. Did that ever happen in your career? Were you helping first assist during opening the patient's chest, and then go and run the pump?

Gary Grist: Well, not at St. Luke's Hospital, because I was doing those other duties I told you about such as running the pump, hemodialysis, hyperbaric. But in the Children's Mercy Hospital, when I was hired there, they made it clear I would have to do other things besides just run the pump. So, for the surgeons, I would work during a typical day for them when they would do a heart procedure in the morning and then in the afternoon they might do as many as ten other surgeries, pediatric surgeries, everything from PDA ligations to Blalock-Taussig shunts to inguinal hernia repairs and fundoplications, and all that kind of stuff. So, I'd scrub for them on those cases and then I would circulate on some of those cases. When they weren't working, I would scrub and circulate for the orthopods and other people like that. At that time, there wasn't any insurance for kids. At Children's Mercy Hospital, our patients rarely had any insurance. So, a lot of surgical work and work the doctors did was pro bono. I remember our neurosurgeon spent one day week at Mercy and that was pro bono. He was putting in shunts, the cerebral shunts, all day long on those kids. But then in the 1990s, the CHIPS Act (Childrens' Health Insurance Program) was passed. So, the hospital started getting some health insurance payments from the state of Missouri and the hospital really expanded very fast after we started getting that income. But before then I was kind of a jack-of-all-trades at both hospitals. It was just expected, and I know you're still a jack-of-all-trades as a perfusionist, and we were just expected to do anything-we were asked to do. And that's how I got involved with sickle cell transfusion, exchange transfusions, and ECMO. And I even worked in the urology department for quite a few years doing urodynamic testing. Urodynamic testing equipment had a roller pump on it. So, my surgeon said,

“Hey, it's got a roller pump, so you're doing this.” So that was pretty tough, doing urodynamics on a three-year-old.

Al Stammers: Wow.

Gary Grist: So, I did a variety of things and that helped me as nurse because I could chart better as a nurse. I learned more about charting, and I had a nursing license, which protected me in a way. I never got sued for anything, but it was nice that I was protected, and the hospital was protected because I was licensed.

Al Stammers: Wow, that's a very good point. And we'll probably touch on that in a few minutes. Let's talk about Children's a little bit more though, because clearly that's where you spent the majority of your career, I assume. Please correct me if I'm wrong, but when you first took the position, you weren't hired as the chief, although you could have been with your experience at St. Luke's and other facilities. So, if you can contrast that, let's say you did come in as a staff perfusionist and then became a chief perfusionist. What would you say some of the challenges were? Clearly working initially as a staff person, but then moving into management and overseeing several individuals, such as a chief perfusionist, as you were for the majority of your career.

Gary Grist: Well, when I started at Mercy, there was one other person functioning as a perfusionist. She was a nurse, and I guess you could say she was the chief, but there were only two of us, so I knew more about perfusion than she did. But she had worked there longer than me, so I guess she was recognized as being in charge of our two-person department. And I worked that way for quite a few years. And in 1986 or 1987, I got a nursing degree, so I was doing other things. So, in 1990, when I went back to school, I got certified. And right after that, in the early 1990s when insurance came along at the hospital, its services kind of exploded because we were getting all kinds of patients then. Instead of heart patients being sent all the way to St. Louis, which was the closest place besides Kansas City, we kept most of them in Kansas City. And at that time, we started hiring some additional perfusionists, and I think we hired two or three. We had a staff of two or three when I got back from school, and the old perfusionist who was there, that one who was a was nurse I worked with for so many years. She retired from perfusion. She didn't want to have anything to do with it anymore. So, Dr. Holder made me the chief, and I hired one or two other people within that time span until about the early 1990s when we started doing many, many more cases. We went from about 200 cases a year to about 500 cases a year. So, I had to hire more staff then. And you should know because I hired a bunch of your students who rotated through our program. They were great. Your students were always great, and I wish I could have hired more but I only had room for so many.

Al Stammers: Well I just don't mean to puff Gary up but Gary is also the recipient of numerous awards. We're going to get into some of them in a little bit. But he was also an outstanding faculty member at the University of Nebraska Medical Center perfusion education program. I assume that continued right up until Gary retired in 2014. But let's follow that train of thought. Gary, I'm glad you brought that up because you have been a

consummate teacher. You've been involved in multiple perfusion education programs. Even today you're still on the faculty of several programs, and you've won numerous awards for your outstanding teaching and mentorship. Talk about that and how important is mentorship now in the realm of perfusion, both what you initially experienced, and then give us your thoughts about today with those of us who are perhaps still out practicing. How important is being a good mentor to individuals not only who are students but ~~are~~ for those who have recently entered the field?

Gary Grist: Well, you say I won awards. I think one of the proudest awards we got at the hospital wasn't just me but the other staff. Your students gave us the award for the best clinical rotation, and I was very proud of that because we were a pediatric program. A lot of students when they go to a pediatric rotation they just watch, they don't do anything. But I always tried to get our students into cases and have them do hands-on cases. We stood over them the whole time, and we never left them alone. But they actually ran the pump, used the clamps, did the calculations, and they really loved it. Most of them really liked working in peds. Everybody was kind of afraid when they came to it but once people started in it, they loved it. What was the other part of your question?

Al Stammers: Just what are the challenges that a perfusionist today who's wanting to mentor an individual, either a student or even a practicing perfusionist? Many of the perfusionists, as you've mentioned, you hired were right out of school. I mean, they were definitely green behind the ears. And so that's a very difficult situation and scenario in the pediatric realm, and that's got to be very, very challenging. So, how did you address that? I mean, let's say you had a new perfusionist right out of UNMC or one of the other programs. And how would you address that individual coming into such a dynamic pediatric practice as you had at Children's Mercy?

Gary Grist: If I was hiring somebody, I'd try and pick somebody who I really felt had a sense of responsibility and really wanted to do the job. All your students were like that. But even when I hired other people, I hired them because they were enthusiastic about what they wanted to do. They would listen to what I had to say. I did not hire anybody if they'd say, “Well, I do it this way.” One thing I tried to do was to get everybody in line and do everything almost the same way. There wasn't a lot of flexibility outside of the techniques that we wanted them to do. There are other places where perfusionists run a pump the way they want to run it, and other people do it in the same place a completely different way. We never did that. And one of the reasons we didn't was we wanted to track our quality control. We kept track of certain parameters that we used on the pump, and we compared perfusionists’ performance on the pump, over a period of many, many years. So, we were all trying to do things the very same way and get the same outcomes, and everybody was on board with that. People liked doing that. If they didn't want to do that, they didn't last very long. So, I guess I was, in that sense, I was pretty stringent. But nobody ever complained about it that I know of. Maybe behind my back they did, but the key point I emphasized was safety. I thought in my early years as a perfusionist, running a pump like you see in the background there, that could be a death trap if you didn't know what you were doing. Disc oxygenators were bad oxygenators.

There were lots of additional pumps involved. Anesthesiologists really didn't know what was going on, and the surgeons, although they had run the pump at some point in their residency or fellowship, they felt like if they operated it once they knew everything there was to know about it, but they didn’t—they didn't have any idea. So, when we got into trouble, I expected that they would listen to me, and if they didn't listen to me, I made sure that they knew I was serious about what I was telling them that they needed to do. They needed to stop this or start this or change this or something. So, it's pretty firm, and if that's a trick, that's what I did.

Al Stammers: Excellent, excellent, great answer, Gary. Gary, I'm going to shift a little bit here, but we're going to circle back several times during the interview, and I'd like to talk about your research. I remember years ago there was the oxygen pressure field theory (OPFT) and this really gets to oxygen delivery. You've been a champion of oxygen delivery. Anion gaps, venous and arterial carbon dioxide gradients. So many important parts of what goes on with the adequacy of perfusion, but it was really the OPFT. And I remember when you started publishing on this, I tell you, it was some of the most interesting research I had encountered. I mean, I've read your papers numerous times, and it took several times before I think I even had a basic understanding of what you were trying to say. But you were presenting this all throughout the world, actually, and definitely across the United States because there was so much interest in it. So, let's talk about that. Let's talk about research. How did you initially move towards that? You were a very busy perfusionist, and you're managing perfusion at one of the busiest children's heart hospitals in the country, yet here you are doing research at the same time. How did that occur?

Gary Grist: I helped start the ECMO program in 1986 at my hospital. And by 1990 we'd done 100 or 120 patients, I can't remember how many, and about 75% of them survived, but 25% of them died. And that really bothered me because when a child got meconium aspiration and we put them on ECMO for respiratory failure, they didn't die from meconium aspiration, but they died from a brain hemorrhage or they died from renal failure, or they died from just organ failure or something like that. Nothing to do with the original diagnosis. So that bothered me a lot. And then when I was out in Oregon doing the certification class, I had to do a capstone project. And I came across an article by Popel [Popel AS. Theory of Oxygen Transport to Tissue, Crit Rev Biomed Eng. 1989 (17:3): 257- 321. PMCID:PMC 5445261] that talked about August Krogh and his oxygen pressure field theory. And I'd never read anything about this before. I mean, I had studied all the open-heart parameters, oxygen delivery, oxygen carrying capacity, cardiac index, and I knew all that stuff. But this oxygen pressure field stuff, I didn't know anything about it. I thought, well, this might have an answer to why patients die when you don't expect them to. And so I started studying that. And to make a long story short, I came up with two parameters that were really important. One was the mathematically corrected anion gap and the second was the venoarterial CO2 gradient. And when I used both these parameters to evaluate the patients, I could predict which ones were going to die early in their process, in the first 12 hours or so. So, I would tell the surgeons and the neonatologists. I said, “This kid's not going to make it, he's going to have a brain hemorrhage or something.”

And lo and behold, that happened. Those things occurred. And the doctors were kind of dumbfounded. They would say, “Well, how can you predict that?” So, I studied OPFT and learned about these two parameters and started to use them, and I could predict what was going to happen. And the problem that I had was, what could I do about it? I knew that they were going to die, but I didn't know what to do about it. And then when we started extracorporeal cardiopulmonary resuscitation, or ECPR, which was a few years later, it became even worse because not only were patients just on high ventilator settings or post-op hearts, but they were coming into the hospital in shock, getting CPR, and we're trying to put them on ECMO and keep them alive. So, I had to figure out why, why these two indicators were killing these patients or correlated to the death of the patients. And it all boiled down, to reperfusion injury. If you take somebody who's in severe shock and put them on a heart-lung machine, then the reperfusion injury from the heart-lung pump will kill the patient. And so, I started studying reperfusion injury, and I figured out these parameters that I was following were indicators that the patient was going to have a reperfusion injury when you put them on pump. And then I had to figure out, well, how do you stop that? How do you prevent it? And then I learned all about using hypothermia, clear primes, low calcium, and another important aspect was dantrolene. We used dantrolene to block the calcium reperfusion injury that can occur, which is just as deadly as the oxygen reperfusion injury. I could never understand, after I learned, that why they were still giving calcium to CPR patients. I knew that if their heart started again, the calcium was probably going to kill them. So that's kind of how I got started working with it. I wrote several articles, as you know, and you were the editor of the Journal of ExtraCorporeal Technology for a long time. A lot of the articles came across your desk. And I just started reporting what I was seeing and what I was learning. And then just before I retired, I thought, well, shouldn't I write like a book or something about this and explain how I do these things? And some other perfusionists recommended don't write a book because books have limited editions, and they're going to be out of date pretty quickly and everything. So, I decided to start a web page and put all this stuff on a web page, and it could be accessed by anybody all over the world. It's a free educational webpage called Perfusion Theory. And they can find the whole theory, the oxygen pressure field theory on that web page. And I've been contacted by quite a few people throughout the years. I mean I've had tens of thousands of hits on my whole web page and thousands on the oxygen pressure field theory part. And just last summer, a surgeon from Maryland contacted me. He's doing some work for the army. They're trying to revive soldiers on the battlefield who had bled to death. And he was trying to do this with pigs. He was bleeding pigs out and then putting them on pump and trying to revive them. And they were all dying and he heard about OPFT. And he talked to me about it. I spent some time talking to him on the internet. I never went to Maryland to meet with him. Anyway, what he learned was kind of a revelation to him. So, he started trying to do it this way. I haven't been back in contact with him, so I don't know if his experiments have been successful since I suggested these techniques, but he was interested in that. Well, that's where most of my research was focused.

Al Stammers: That's fine. Now this is great, and it's a good segue because you've mentioned several times the acronym” ECMO”, and I think most individuals would

understand what that is. But if anybody is listening or viewing this as it's going to be posted on the AmSECT website, ECMO is extracorporeal membrane oxygenation. And Gary said he went, well, he didn't say it, but I know he did. He went to Ann Arbor, which was the leading ECMO center in the world, definitely in the 1980s, and he trained there, and spent, I believe it was a week at the ECMO course with Dr. Bartlett and his team. But you've also, as you just mentioned, instituted ECMO or was on the team that brought ECMO to Children's. And you spent your whole career really being an advocate for ECMO. And as you've just explained to us, you participated in the improvement of ECMO by understanding the physiological aspects about oxygen delivery and obviously carbon dioxide removal during the ECMO procedure. But let's talk about ECMO for a second or two here. What do you believe have been the greatest changes? You talked about obviously hemorrhage and some of the challenges that you experienced. But what did you see as some of the greatest changes back in the 1980s and early 1990s? And if you would be so kind, what do you think the challenges in the 2000s and even in the next decade might be for ECMO?

Gary Grist: I don't know. That's a big question, Al. We were the sixteenth ECMO program to open. We did our first patient in February 1987. Before that we trained for a year using sheep in my hospital. We did one sheep a month for 12 months. And we didn't have any money for pumps, so I borrowed three hemodialysis pumps. Actually, they were given to me from St. Luke's Hospital where I used to work, and I converted them to ECMO pumps. And the surgeon I worked for said, “Don’t worry, we're never going to do anything bigger than a baby.” So, these pumps are all designed to run babies and or lambs. And like I said before, the things that bothered me was about how the patients were dying—that bothered me. So anyway, we got better and better at it, I started publishing on it. I got comments from other people about how to do it, and people were having more and more success with it. I haven't looked at the ELSO Registry results recently, because I don't belong to that organization anymore. So, I don't know how people are doing now, but they're putting patients on ECMO or doing ECPR, which is a form of ECMO on patients that we would never do in the past. For example, if they brought a patient, a baby from another hospital to our hospital and they were doing CPR as they came in the door, we wouldn't put them on ECMO. But we just got to the point where the neonatologists said, “We can't just let these kids die, we’ve got to try and save them.” So, we did more and more difficult cases. A lot of post-op hearts, but not a lot of them. Patients that wouldn't wean off cardiopulmonary bypass got placed on ECMO. Nobody died in the OR anymore. It used to be we had a lot of pediatric deaths in the OR, and the staff would baptize them in the OR before we turned off the pump. It was very sad. But once ECMO came around, anybody who wouldn't wean from the pump got on ECMO, and we just got better and better at it. I learned a lot more about it by using and understanding this oxygen pressure field theory concept. And I don't know what else I could say about the future here. Like I say, one of the things in the future this surgeon wants to do is to try and revive soldiers that have died from bleeding to death on the battlefield. Well, I can see in the future, people on the highway who are killed in a traffic accident on the highway because of bleeding or by some other problem. They will try to revive those people in Emergency Rooms using the pump, using special reperfusion techniques with the pump. Instead of just saying they're

dead at the scene, they start doing CPR or something or cooling them down or something like what is done for drowning people. Now, if kids drown, they'd leave them cold. They don't try and warm them up while they're doing CPR but leave them cold until they get them on pump and then try and revive them there. So, I can see ECPR coming along where they try and revive patients we've never thought we could revive in the past. So that's what I see the future coming down to, especially in trauma units where they get a lot of cases coming in from one thing or another and the patients are declared dead, but they might not be considered dead until they spend some time on the pump. And that's going to happen in the ER, not necessarily the ICU or the OR.

Al Stammers: That's wonderful, Gary. And it sure is something that's exciting because that classification of patients really never was considered for ECMO. So that's something that I think you're exactly spot on that we'll see hopefully in the next few years. I'm going to go ahead and embarrass you now, so you don't have to say anything. But you know, awards, clearly Gary has said it so many times so far in this interview. You don't do this for the rewards or the recognition per se. You do it for the patient's benefit, as Gary has devoted his whole life to. But in that comes recognition, you know. Gary is the recipient for Clinical Excellence in Nursing as a perfusionist. Most individuals who receive that award usually are not wearing two hats. A nurse and a perfusionist. Gary was doing both, which is remarkable, probably unprecedented at Children's. He also, with his work in ECMO, has received the Excellence in Life Support Award multiple times, he and Children's Hospital. But from our professional society, AmSECT, Gary has received every major award as a perfusionist, the Award of Excellence, Perfusionist of the Year, Research Award, and more recently the Gibbon Award, which is the highest honor that is bestowed upon individuals. You don't have to be a perfusionist. There are many surgeons who have won this award, and I believe a few anesthesiologists as well as a handful of perfusionists. So, there's no question there, Gary. I just wanted to relay to individuals who are watching this or maybe hearing it, the remarkable contributions you have made. But now I want to switch for a second here and talk about safety. You've said it several times, and I think the better part of your career and clearly now has mainly focused on safety and perfusion. Talk a little bit about what you've done with the AmSECT Safety committee and the wonderful work, and information published on the AmSECT website that you were the primary author of.

Gary Grist: There was an article, and I can't remember the name of the authors. I'm terrible because I'm so old I can't remember names anymore. It was about FMEA's, failure modes and effects analysis used during open-heart surgery with the pump. And this actually was a student paper that was done. He was a student down in Arizona. Anyway, I was very impressed by this, and the reason I was is because throughout my career I had always tried to train my staff perfusionists in the safety practices that I had used. And I realized this FMEA was a way that you could store experience so that other people could learn what you had benefited from, what you'd learned from. So, I started writing this, and I also realized that after I retired that there were a lot of retired perfusionists that could contribute to this. What an FMEA does is it recognizes or identifies something that could fail and then it says why it could fail or how it could fail and if it fails, what's it going to do to the patient? And then how do you keep it from

failing? How do you mitigate it or deal with the failure? And then lastly you rank it. Is it an important failure? Is this something that's going to occur frequently or is it extremely rare? And I got several of the retired perfusionists to participate in this. I would give them a problem and say, “Okay, here's the patient, there's a risk of an air embolus in this patient. How do you deal with it?”
And they would say, “Well, if you get an air embolus, it's going to do this to the patient, and here's how I prevent it.”
So they helped me write these things, and I wrote I think about 50 of them for heart surgery and then I think another 25 or so for ECMO safety, and I put those on the AmSECT website. So, I was very interested in safety and conveying the things I had learned about safety and how to predict problems and prevent problems before they happen. I was not a big fan of the incident reporting system. I like the one that they have in Australia, which is pretty good. But AmSECT started their incident reporting system, and I wasn't very happy with that because it doesn't teach people anything, I don't think. I mean, it reports an air embolus or something. So, what, I mean, how do you deal with it? It's better to prevent the embolus, and with FMEAs, you know what to look for and how to prevent it and how to deal with it before it happens and how to rank it and how to risk it. And then when you have all these risks outlined and you can put your highest risk issue at the very top of your analysis and say how can we fix this? What can we do? Can we buy some equipment? Do we have to have further training, what do we do in our program? And that's something an incident reporting system can't do. So, I got them on the AmSECT website, and I'm not part of the safety committee anymore, but I think the failure modes are still on the AmSECT website.

Al Stammers: Yes, they are absolutely a very prominent part of it. Gary, let me ask you a question now about some personal characteristics. Clearly, you epitomize what a professional should be in our field and in nursing, as well. But what characteristics or attributes do you feel would be most important to being an outstanding perfusionist today?

Gary Grist: Well, I think you want to make a difference in people's lives. Not everybody wants to do that. Some people want to go into finance or become a politician or something, make a lot of money. But I think people who are dedicated to making a difference in people's lives, I think that's the first thing you want to do as a perfusionist. And then you have to have persistence because you're learning, you're never going to stop learning. You learn every day, every year, every challenge that you have to meet all the time. So, you’ve got to have persistence. You’ve got to be willing to work strange hours. Maybe it's not so bad now, but back when I worked for the surgeons, when I was there by myself, they might do two, sometimes three open-heart operations in a day. And then the next surgeon would come by, and he would start his day, and do two operations. And I was the guy who worked the 24 hours in a row. I was the perfusionist that ran all those cases for those surgeons. So, you have got to be willing to do that. There's a really good article from Eileen Heller-Standing on my website about being a perfusionist on holiday on Thanksgiving. And it's a very profound article. So, if you go to the website, read it. It's really good. And she talks about the dedication you have to have not only with your family but being a perfusionist to try and make a difference in

other people's lives. So, if you don't want to do that, if you're not interested in that, you probably wouldn't make very good perfusionist.

Al Stammers: Well said, well said. Let's talk a little bit, just for a minute or two, about giving back and how do we as perfusionists, how did you contribute to the community spirit? You know, obviously right now in your retired state? And I think I'm going to have to send you the definition for retired because you're doing more work now than I believe you've ever done. But how important it is to contribute back, whether to the perfusion community or from a social perspective to our local communities, to volunteering and other altruistic behaviors, you've demonstrated it. But if you had to rank that how high would that be in your list of top attributes for an individual to possess to be an outstanding perfusionist?

Gary Grist: Well, I think when I retired, I wanted to stay active in some way. I didn't want to pump cases anymore, and I didn't want to take call anymore. That was a lot of work, and I was getting older, and it was harder to do. So, when I retired, I wanted to stay active. So, I started a website. Like I told you, I put a lot of stories and the procedures I did into the website. The students that would come down to the hospital would always want to hear perfusion war stories. Tell us what you did then, what was it like then? How, how did you handle that situation? And they wanted to hear these stories. So, I thought, well, I'll put them on the website. And also, the website is where I put the oxygen pressure field theory where people can access it from all over the world. I've had hundreds and maybe thousands of downloads of it all over the world. So that was better than a book. It didn't cost too much to have a website, and that kept me active. And then one day I got a phone call from David Webb. I had been asked to lecture many times for the programs at SUNY and at Arizona and other places and give individual lectures on safety and other aspects. But David Webb called me up and he said, “I want you to come help me at Lipscomb University. We're starting a new school.” So, I said, “I can't come there. What do you want me to do?”
He said, “Just do distance classes." And so, I started teaching the pathophysiology class there, and now I'm teaching the capstone class for them. And so it just keeps me active. I feel kind of bad because so much about perfusion education now is simulation and all the new pumps and devices that people are using, which I don't know much about. I don't know much about running those computers, computerized pumps and that kind of stuff. But I try to give people the benefit of the experience I had and tell them not to make the same mistakes I made in the past and how to avoid mistakes. So, it's fun. I don't have to work very hard at it, but I enjoy the community with the students. I had three or four students contact me today about a project they were working on, and it's nice to wake up and look at your email and somebody thinks you're still useful for something.

Al Stammers: Gary, we're almost at the top of the hour, but I have a question that's a personal one. And I think by you sharing this with so many of us, those of us who are retired or those of us who are just starting in the field, it would really mean a lot. And if you had to say in your own words, what did you enjoy the most about being a cardiovascular perfusionist for basically over five decades?

Gary Grist: The thing I enjoyed the most was the daily challenge. Because you never knew what was going to happen as a perfusionist. You hope that things will go routinely, there won't be any problems, but you also know that there could be something that could happen that could ruin a patient's life. And so, I think it was just the daily challenge. No two days were ever the same. They're all different. Some were horrible, but most of them were good, were happy, and patients had good outcomes. So, I think it's just a daily challenge and knowing I'm not going out to sell shoes to people or try and make some money in the stock market. When I saw a baby survive and parents take the baby home….one of the most interesting cases I ever did, I believe that I saw a lot of miracles in my lifetime. People survived, but I didn't think they would survive. And one was a case, it was a post-op baby who wouldn't wean from cardiopulmonary bypass. And we put him on ECMO, and I was sure that he was going to die. He was on ECMO for about five days, and his numbers were looking worse and worse and worse, and I was sure he was going to die. And the parents were there every day. And one night it was time for them to go home because they needed to get some sleep. And I was manning the pump that night, and they had a CD player, and they put in a CD to play lullabies for the baby just before they left to go home and get some rest. And it played some lullabies and then it got to the lullaby, “Jesus Loves Me" on the CD. And there it stuck. It kept playing that over and over and over again all night long. And I talked to the bedside nurse, and I said, “Do you think we should turn this off? It's playing the same lullaby over and over.”
And she said, “I'm not turning it off! You turn it off!”
And I said, “I'm not going to turn it off.”
And when the parents came back in the next morning, they heard this thing, and it was still playing the same lullaby over and over….“Jesus loves me, this I know.” And the dad said, “Has that been playing all night?” And I said, “Yeah.” He says, “Well, why didn't you turn it off?”
I said, “Well, I thought maybe you wanted it as some kind of prayer that you're trying to say for the baby or something.” He said, “No, no, it's broken.”
So, he turned it off. And I was amazed because that day that baby improved so much. And we took him off ECMO that night, and eventually, he went home alive. And that has affected me all these years. That was probably one of the earliest ECMO cases I did. So that's something you take home with you every day, knowing that you did a good job, and you helped save a person's life.

Al Stammers: Wow. I would not ask another question. I think that was a beautiful way to end this pioneer interview of a remarkable individual, Gary Grist, a good friend of mine for decades and somebody I admire tremendously. So, with that, Gary, with your permission, AmSECT would like to publish this interview in the Pioneers of Perfusion archive on the webpage, and I can't wait to get it out there and share it with many individuals not only throughout the United States, but throughout the world. So, with that, again, on behalf of AmSECT, Mark Kurusz, the entire history committee, I want to thank you for sharing your experiences with us and look forward to the publication. So, thank you, Gary.

Gary Grist: Thank you, Al.

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