VOICE EXPEDITION INTERVIEW TRANSCRIPT
The Oral History of Nephrology
Nathan W. Levin, MD
Interviewed by Dugan W. Maddux, MD
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DWM: It is January 23, 2008, and today I am talking to Dr. Nathan Levin. We are conducting this interview in Manhattan and Dr. Levin has been involved in the care of renal patients for the past 4 or 5 decades. He is extensively published in many aspects of renal patient care including hemodialysis treatment and other patient quality care issues. He has been a critical contributor to the NKF K/DOQI initiatives, serving as co-chair of the steering committee and the advisory board. He is also a past president of the Renal Physician's Associations. Currently, Dr. Levin is the medical and research director at Renal Research Institute, LLC. He is also professor of clinical medicine at Albert Einstein College of Medicine and an attending physician in the Division of Nephrology and Hypertension at Beth Israel Medical Center.

Dr. Levin, thank you for letting me talk to you today about the history of nephrology and usually in an interview, I give some background information about where people are born and where they were raised but I would like for you to begin this interview by talking about your background.

NL: Thanks very much. It is really a privilege to have this display of egoism. I was born in South Africa. You want me to say when? Yes, I will say when.

DWM: I would love for you to say when.

NL: On December 21, 1934, and I grew up in Johannesburg, South Africa, where I had all my education. I was a student at the University of the Witwatersrand, which was one of the two major anti-apartheid universities during the years of apartheid in South Africa; a university whose latest Nobel prize winner was Sydney Brenner a few years ago.

DWM: What did he win the Nobel prize for?

NL: In medicine.

DWM: In medicine?

NL: In medicine yes.

DWM: Okay.

NL: He was the one who discovered messenger RNA.

DWM: Oh!

NL: One of his accomplishments, though not his most major one, that was one of them. I became interested in nephrology when I was in my fifth year of medical school, when in two weeks in a row, there was a patient who died in uremia, hypertension and with two different causes of renal failure, and I became very interested in that.

DWM: What year would that have been, you think?

NL: 1955.

DWM: 1955, okay. So at that time when those patients died of hypertension and renal failure, was there anything to offer them? I mean, as you watched them as a fifth-year medical student.

NL: No, no. There was absolutely nothing offered them. In the same way though, I wasn't really conscious so much about what was missing for them, but I remember thinking people in respiratory failure at that time, there was very little to offer them, too; and that was much more common, and I remember very clearly wondering about what will happen in the future - because there were iron lungs already and the whole idea of the development of intensive care units. So I became interested in the kidney and then one day, when I was in my next year, in the beginning of my final year - it is a six-year program in South Africa - I spoke to Dr. Morris McGregor, who was my first clinical teacher, who became later chairman of medicine and dean of McGill in Montreal, and I talked to him about pyelonephritis and hypertension as being something that seemed to be related from what I could just observe in the literature, and he encouraged me to do a retrospective analysis of postmortem data, which I eventually published in the student medical journal. At that time I was, (s/l) in the index medical school, the leech, and I was really happy and pleased with myself, I had to say until Priscilla Kincaid-Smith, who was a South African and a friend of one of my aunts - they used to play hockey together at university - she bitterly attacked this and said I didn't have the idea at all. I wasn't pyelonephritis at all, it was interstitial fibrosis, which I was mistaking for pyelonephritis and since I didn't have a clue about either, I was quite upset at the time. And then the change in my career occurred as a result of sitting in a conference one evening and a friend of mine pointed out to me, Dr. Ben Goldberg, two rows ahead and said he had just come back from being a fellow with (s/l) Pietz at St. Mary's Hospital in London where renin was first developed as a subject for examination and study, and I pucked up courage, and I was very shy, and I went up to him and introduced myself and I said I was interested in kidney disease, so he looked at me and he said, "Well, I've just started practice and I haven't got much to do. Come and see me tomorrow." So the next day, armed with my little volume of Homer Smith's book on principles of renal physiology in my hand, as if to show I was really genuine in about my interest, I went to

see him; and we spent about half an hour talking. He had very little to say. He is a very quiet man. He said, "Come to the laboratory on Sunday morning and we'll start." So for many weeks after that, and some evenings in the week, he would teach me, he did teach me flame photometry and the use of a spectral photometer. We measured inulin. We did pH clearances with patients and I learned an enormous amount from this man who had never seen me before and just was so generous with his gift. He was one of South Africa's most outstanding physicians, nephrologists and he became known as the doctor's doctor, and I owed him so much, and I always venerated him as did everyone who worked with him. He died unfortunately a few years ago. It is of interest that his brother, Dennis Goldberg, was imprisoned with Mandela and was in jail for 22 years and anyone interested in the history of that, there are now recent books about the original trial of the people involved in treason when Mandela was imprisoned in the early eighties, I guess now. So that was how I got into nephrology and I expressed my interest to my professor of medicine, Guy Elliott, who was of Scott descent. His cousin, Frank Elliott, was I think head of neurology at the University of Pennsylvania, and Guy Elliott was a polymath who new everything about everything, and I owe him a lot, too. When I finally had finished my residency and done a year of history of science and then two years of fellowship, all in South Africa, he was related to Robert Clark. Robert Clark was a South African who trained at Guy's Hospital and was the founder of the method of renal biopsy that we do nowadays, the percutaneous method. Clark was the founder of that. It so happened, and one of the many lucky things that happened to me in my career, that John Barlow was the cardiologist at our university. John Barlow was the person who first identified mitral valve prolapse as a disease and for many years it was in fact known as Barlow's syndrome. He identified this without ultrasonography, so he had the ability to hear and describe as many as eight sounds during the cardiac cycle, although not all at once. And I remember very clearly, he would tell the surgeons before a mitral valvotomy, the surface area of the mitral valve, the estimate. He is still alive, a very confident and convincing person. His best friend was Priscilla Kincaid-Smith, so they were both at Hammersmith Hospital in London when Robert Murkey, who actually was the person working with Clark as a resident, who first devised the renal biopsy technology/technique, and Franklin modified the Vim-Silverman needle to get a cutting edge to get into the kidney as opposed to into the liver, Lokey came to Hammersmith and taught John Barlow and Priscilla how to do kidney biopsies, and then Barlow went back to South Africa and taught me. So I was doing this very early in my life. Shall we stop?

DWM: We can stop, and I do want to though ask what year this would have been then, that you are learning renal biopsy, percutaneous renal biopsy techniques.

NL: Yes. I forgot to mention that dialysis was happening at the same time, which was actually the beginning of my career. That was when I was an intern.

DWM: Yes. About what year would that have been?

NL: '56. '57, I mean.

DWM: Okay, let's stop for a moment.

Very good, and I want to get back to, we were talking about Priscilla Kincaid-Smith learning how to do percutaneous biopsies, and then you also learning the percutaneous biopsy technique. And what year would that have been?

NL: That must have been in the early 1960s/59-60. I did my internship in 1957 and then I had a year of science, which I could describe also a little bit, and then at least two years of residency, two and a half years, and so it is somewhere in that time period. I don't remember exactly. Probably in 1960, is probably the date, whatever.

DWM: All right. And you mentioned that dialysis was happening.

NL: Oh yes.

DWM: Yes, I want to hear that.

NL: Yes, that was really what began my world of dialysis. Well just to go ahead a little, when I told Priscilla Kincaid-Smith some, (when would it have been?) some 12 years later, that I was going to go to Henry Ford Hospital in Detroit, she said to me, "I know what you have done so far," she said, "but don't let the tail wag the dog." And in fact, very much so, the tail has wagged this dog for all my years in dialysis. So what happened was in dialysis actually quite remarkable. In 1954, when I was a fourth-year medical student, I visited Anglo-American Hospital in Welkom, which was where the gold reef from Johannesburg appears about 160 miles away and it was just beginning to be a gold-mining town, and in this hospital I saw an artificial kidney machine, which was one of the very first Kolff Twin Coils and the person who ran the hospital, his name was Dr. Leon (s/l) Sendis had imported this machine through a close contact with Travenol Baxter in the United States. To the best of my knowledge, it wasn't used, so now approximately two years later, Dr. (s/l) Leonsinnes' younger brother, (s/l) Leonsins (his name was changed) was a surgeon at the Johannesburg Hospital and he was very interested in the idea of dialysis, and he had imported a machine from an Italian nephrologist called Confortini. And they really didn't know how to use it, because all the dogs that they tried it on died. But then a year later, they imported the Travenol Twin-Coil, which was like #47, if I remember correctly, and there we were doing dialysis for the first time in Africa on patients. Nurses weren't allowed in the area. There was no necessity for nurses, only a strip of doctors and me. We would use an artificial shunt, Scribner's shunt, had been described - no am I right about that or not - I don't think so. We probably had access to it by cut-down to the artery and vein and this was a machine with two coils of cellulose in a bath and every two hours the bath had to be

changed and we would knowingly smell the bath, look at its color and decide how uremic the patient was. Of course, we could measure urea, creatinine, electrolytes at that time and that was a very exciting part of my life because we were actually keeping people alive until they recovered from their acute renal failure, at least most of them.

DWM: Let's talk just a minute about the types of patients you would have been seeing then. What kind of diseases were the patients coming in with.

NL: These were people who were postoperative acute renal failure and I just remember one who had had a massive injury. I don't know what caused it, who was acute renal failure due to what we called then the crush syndrome, even though it was many years after the second world war. But those are the kind, acute.

DWM: And they were all acute, and you expected you would dialyze them once? Twice?

NL: No we dialyzed them hoping that they would improve and most of them did, from my remembrances. I don't have a clear record of even how many we did. They were definitely acute renal failures. I think they were probably chosen on the basis of the likelihood of them recovering in terms of age and otherwise healthy people.

DWM: So they were otherwise healthy, yes.

NL: It's hard, actually I was taken up with the miracle of the technology and the chairman of medicine's brother, no that's not true, the chairman of medicine didn't really like the idea of an intern being involved in this and it was a battle. Unfortunately he went away on a vacation and I sort of slipped in and by the next year I was an accepted member of the renal team, when I was doing my science year because then there was all the time in the world. Again, a great, very fortunate. So that was the beginning of Ben Goldberg being the chief of it and as it became more routine, the nurses took over the course of that, but that took a year or two.

DWM: So you would have a physician or the team at bedside.

NL: All the time, every minute. You know, day or night.

DWM: Yes, and you all would be setting up the machine, and...

NL: Yes.

DWM: ... putting the chemicals in.

NL: We poured the chemicals in. It had to be, let me see how did it work? You had to acidify it after the calcium had dissolved, that's how it was. So at the end, you had to pour in so much lactic acid in order to, was it lactic acid? I guess so, in order to get the right pH of the bath when you tested with a stick and then confirmed in the lab. It was a whole business. I think no one died because of our lack of technology, although one terrible accident happened where I think quite understandably, someone forgot and let go of, unclamped the line and the coil burst and everyone was covered, absolutely literally covered in blood, but the, you know the moment shock of this, it was actually quite funny. It doesn't sound funny, but nothing happened to the patient, not much. The blood pressure fell.

DWM: Yes, but it does sound like when there was a burst, it was a pretty dramatic event.

NL: A very dramatic event, yeh. So those were the early days of dialysis and I have never given up my interest in it over some 50 years later and I have enjoyed seeing the field grow from those very early beginnings and it's not to say of course, they were the first dialyses in the world, but they were one of the first in academic institutions as far as I know. Obviously Kolff had donated his machines to various institutions in the United States and I presume Eli Friedman in fact, must have told you about that because he was already a little, he started off the program in the United States.

DWM: Right. I do know that he was at the Brigham and they had one of the early Kolff machines.

NL: Yes, there was one in Canada as well.

DWM: Yes. So you're finishing up your residency and you're involved in acute dialysis with the Kolff machine.

NL: Yes.

DWM: So where did you go from there? How did you decide to stay in nephrology and what did you do from there?

NL: Well, as I mentioned earlier, my professor, Elliott wrote to Robert Clark in Chicago, and I was fortunate enough to get what was called in those days United States Public Health Service fellowship to Chicago.

DWM: So from South Africa you got the United States Public Health Service...

NL: What it was, they gave two to each country, to many countries. Actually my first choice was Merrill, the very same Merrill because I had his book on acute renal failure, which he wrote

with Hampers, I think. That was the man who started NMC, you know? And he was my first choice. I didn't know of Dr. Clark actually. He hadn't yet made his name and Merrill wrote back to me that I could come next year, but you know the feeling of wanting to go was very strong and then Clark fortunately took me.

DWM: And at that time, what made you sure that you were interested in nephrology?

NL: Well having been on this dialysis thing and seeing what one could do, and starting off with this interested in kidneys, and we were doing research work on things. For example, one of the noteworthy things I was involved in was analgesic nephropathy. It started off with a journalist who had apparently had blood in the urine and what appeared to be kidney stones and in those days, there were no DRGs. They stayed in the hospital a long time. And one day I sat down next to him, having just come back from the library where I saw an article in a Swiss medical journal about analgesic nephropathy that was due to a combination of aspirin, phenacetin and caffeine, and in some cases, aspirin wasn't necessary but phenacetin was the common ingredient, and I said by any chance, because we had taken histories from him before and I was a resident then, and I said were you taking these drugs? And he said, "Yes. I take handfuls of them every day, 20 or 38 BCs a day," and then that gave rise to a tremendous amount of research work and we found it to be a very common condition, particularly in women and in Australia, it was in fact the commonest single reason why women were in renal failure. It was analgesic nephropathy. It was all over Europe and not very much in the United States and the United States people doubted that it was actually the phenacetin, but it was because when phenacetin was finally removed, the condition almost entirely disappeared, as you know. So we were doing that and also we were doing work on body composition, extracellular fluid. I remember one of the interesting things we did was in regard to looking at electrolytes and hematocrits at Johannesburg with an altitude of 6000 feet and sea level, and we found some quite remarkable thing that because of slight hyperventilation due to the small drop in pO2, bicarbonates were lower and sodiums were lower and most interesting of all, although the hematocrit was higher, the red cell mass was not increased. Not statistically, while the plasma volume was reduced, so there was a compensatory mechanism, which allowed for the higher hematocrit in Johannesburg. So I was part of a very vital group of people doing this kind of interesting work on a variety of topics. So anyway...

DWM: So you are very interested in nephrology. You know that is what you wanted to do. You finished a fellowship essentially in nephrology.

NL: Yes, in Johannesburg.

DWM: Yes.

NL: Obviously it wasn't a fellowship of the curriculum of today.

DWM: Right.

NL: It was made up as they went along. It gave me a lot of practical experience and also the opportunity to be in a laboratory where the professor, whose name was (s/l) Heime Stain, he was a man of immense generosity. He had a very long desk, about 30 feet long, really long in this room, and he was concentrated in the middle of it and he had his papers all over. And behind was the lab bench in this place. And for a year I stood behind him and I did my work, and I heard everything that was going on except on the rare occasions when he would ask me to leave. So I learned an enormous amount of clinical chemistry. He was head of clinical chemistry. He was also a famous microscopist and I well remember at the time and I can tell you the name but you will edit it, Priscilla's brother had severe hematuria and I saw him, I had his urine, so Professor (s/l) Stain said after looking at it, "I think this man has a bladder stone." And he did! And the reason I asked him, how would he know that, and he said because there is such a lot of mucus there with the blood and there are no casts, so it is nothing above and there is so much mucus there, he probably has something in his urethra or his bladder, and so it was. So I had everything of the best with a man in front of me with enormous knowledge, added to all the medical journals so I could see exactly what went on and doing my work on electrolytes and colorimetric tests for antipyrine. We developed a colorimetric test for antipyrine. It was just heaven.

DWM: It sounds like an incredible experience. So you the decided to come to the United States.

NL: Yes, and I had this job in Chicago as a fellow.

DWM: Yes. And about what year would that have been?

NL: Now that I am clear about, it was 1962.

DWM: So what was your job?

NL: I was a fellow.

DWM: Fellow.

NL: I was a research fellow with Robert Clark and Robert (s/l) Merkey and Victor Pollock, who was also a South African, who were writing the natural history of glomerular disease at that time. Anybody almost who they could get hold of, who had a trace of protein, got biopsied. Biopsies were done by the hundred and I literally say they did one series of 500 biopsies and you know, that's how I was fortunately become quite adept at that, so when I was in charge of a renal unit some years later, I was able to teach people on the basis of experience.

DWM: Right. So in what hospital was this?

NL: This is what was then in those days Presbyterian St. Luke's Hospital in Chicago, and the University of Illinois. It wasn't very many years after I left that Presbyterian St. Luke's Rush Medical Center got its charter back and they were its own Medical School and then broke off from the University of Illinois and today, that's what it is, Rush Presbyterian. It's a wonderful hospital, of course, even then. But just to say briefly, on my way over to New York with my family, I met Cyril Donninger, who was the best graduate of his year, a brilliant man who invented flypaper for Shell, you know the kind of fly paper that was being used. I mean there must have been earlier fly paper. And he said to me, "What do you want to do in Chicago?" I said I really don't want to do renal biopsy pathology, which was their main work. He said to me, "Are you interested in metabolism of the kidney?" I said I'm very interested. He said, "Why don't you perfuse animal kidneys and study the metabolism?" And I said that was a wonderful idea. So I when I visited Dr. Clark, I mean on the first day I met him, he sat me down and he said, "Well, what do you want to do while you are here?" And I said, so I don't want to really do pathology and he said, "What do you want to do?" Not very happy. I said I'd like to learn how to perfuse kidneys. He said, "Fine. Good. There is someone perfusing hearts at the University of Illinois. You can do it." So for the next 18 months, I struggled to get the kidney to work. In those days nobody realized that if you have blood in glass it activates platelets and you get clotting virtually almost always. So I used to get up 3 mornings a week, very early, go to the animal lab, get a rabbit and after killing the rabbit, take out the kidney, put it with my catheters, put them in the device and it failed. But you know the strangest thing was, and I always think about that day, I wrote it in my diary, which I kept for about a month, that that very first day, it made urine, a lot of urine. That very first day and never again did it make so much. People came from all over the hospital to see this little kidney making urine. So I had no idea at the time about the problem with activation of platelets and you know, it took years before people realized you needed another organ or you needed special surface.

DWM: Right.

NL: People were perfusing kidneys without blood. they were doing it with a saline or plasma solution.

DWM: Solution.

NL: But I was persistent and I failed. So I had many studies on the failing kidney, which actually are not useless. You know, I could see that acid hydrolases were produced in large amounts, for example. And I would _____ paper there on the metabolism of lipids in the failing kidney, so it wasn't a failure, but my first 18 months or two years in Chicago were really not very valuable for anyone.

DWM: Were they almost entirely in the lab?

NL: No, no. I was also a clinical fellow.

DWM: A clinical fellow. And so what was happening in the clinical side at the time for nephrology?

NL: Well that was the funny thing, you see, because here I came with a lot of knowledge of hemodialysis and the first thing I asked was can I see what hemodialysis machine you are using and they said "there it is" and they opened a closet. It was in there and they didn't use it. They had no basis for acute dialysis. They did PD, which I learned about. I didn't know that from South Africa, but they didn't have any acute dialysis. It wasn't at that stage in the United States really. In 1962, there was very little hemodialysis, at least certainly not in Chicago.

DWM: Right. So tell me, do you remember about the peritoneal dialysis they were doing at the time? What was that like?

NL: It was using straight catheters, you know these metal ones with a metal cannula. There was no what's the word, the name of the catheter for?

DWM: Tenckhoff?

NL: Tenckhoff catheter.

DWM: Or chronic indwelling soft catheter was a trocar essentially?

NL: There was none of that. Trocars. So there was none of that.

DWM: Yes. And was the fluid, what fluid were they using?

NL: Oh, you mean well _____ was the name of the company. I remember...

DWM: Did it come in a plastic bag by that time?

NL: No it was a bottle.

DWM: The bottle, yeh. Okay. So you did a little bit of PD acutely, I'm guessing, still very healthy patients having a single injury and...

NL: Yeh. Yes, the PD was that kind.

DWM: Yes.

NL: And I'll tell you much later about our current interest in something similar in Tanzania today, which it is funny how it goes back in the full circle. And there were a lot of conferences. I don't know, Conrad Perani, who became famous at Columbia as one of the top renal pathologists in the world, he looked at all the biopsies and we used to have these meetings, of course, where Dr. Clark used to pick on everyone to describe what they could see and give a diagnosis. He would do things like...

DWM: Some things never change.

NL: Never change, no. One day we saw this rather unusual looking glomerulus and we went around the room over, and over, and over, until like 20 questions, we finally came to the onset it was a whale glomerulus. So those were very interesting days. There was some new work going on with Dr. Herman Mettenheimer from Berlin, where they were isolating enzymes in the tubular epithelium from biopsies. This was not just pathology now, they had moved to further study and that was some of the very earliest work on, you know, where the enzymes were leading to what they did.

DWM: Right.

NL: So it is very fascinating, that kind of things were. So I don't know, the rest of it is a blur to me. Exactly what I did my last six months and I can't even remember. I really can't. It's strange.

DWM: So when you finished up in Chicago, where did you go?

NL: Well it was compulsory to go back to South Africa and it was not my intention to stay in South Africa, but I didn't have any plans. So I got a job then as the therapeutic trials physician for the Province of the Transvaal. South Africa those days had four provinces. Now it has many more. Which means that in addition to working in the renal division, which was now really going, I had been away two and a half years. I was advising the hospital on what drugs to buy and as I said first, I learned a lot about clinical trials and about pharmacology. My life was very difficult because the language of the province where I had to go and give my opinions was Afrikaans and although I could speak conversational Afrikaans with patients, to speak at the level required was very embarrassing and it was really very difficult and traumatic, and I, you know, did my best but I'm sure they thought it was pretty funny, this English-speaking guy from Johannesberg. This all took place in Pretoria, which was the hotbed of Afrikaans culture. So then, I decided that this was not the place to bring up children, even though my ties were very great and they still remain to South Africa and I've been back many times, in futile attempts to do things of any value. So eventually I got a letter from David Earle. David Earle was the other

nephrology division dealing with pathology of the kidney and that's at Northwestern University. So he invited me to be considered for a job with him. The Veterans' Administration Research Hospital across the road to Northwestern was just opening then and there was going to be a new nephrology division in it. So because there was an International Congress of Nephrology in Washington in 1966, he invited me to come and visit here and see what could be done. That congress of nephrology was headed by George Schreiner, who I grew really to love and admire. He was such a warm and wonderful man, and so I met him at that time and this is important for my later story about what happened later. And I went to Dr. Earle, and I had an appointment with him at 11 o'clock. I remembered him very vaguely because he had been at some meeting I'd been at while I was a fellow, so I wanted to be early, so about an hour earlier I wanted to know where his office was, so I walked up the stairs and I had a collision with someone. We both fell down and I apologized profusely, and you know what's going to happen, so I walked in an hour later - it was him. I didn't realize at the time it was him. So...

DWM: You were off to a good start!

NL: ... it was a terrible start. So I think he realized I was clumsy for many years. So anyway, after a while we had a discussion and later he offered me the job, and I went there and I spent 5 wonderful years at that, but if I can go back to the earlier years, so before I left in the year that was remaining, that was '66 to '67, together with a nephrologist from Cape Town who is now dead, called Lennox Eales, who was an expert in porphyria, which by the way is very common in the South African Dutch descent population because one of the original 16 settlers (but that number may be wrong - a small number) had this gene for porphyria, so porphyria is widespread there, tens of thousands of people with this particular kind of porphyria. So we decided to have a meeting, a nephrology meeting in Johannesburg to last a whole week and that's youth really, trying to do something ridiculous and there weren't many nephrologists in South Africa. In fact, you could count them on the fingers of two hands, I imagine. But there were many general physicians and they came, and I invited Priscilla Kincaid-Smith and George Schreiner, and I had no idea how to delegate lectures, so I had them speaking every day almost, which doesn't happen, you never find, people doing that, and it was a very nice meeting and Dr. Schreiner, who came on the Saturday of the week, I remember him arriving, I'd met him of course in Washington at the International Society and he had a huge box of slides. He said okay, what do you want me to speak about. There was going to be a black-tie dinner for the opening now also, the new National Kidney Foundation. Even when we founded the National Kidney Foundation and the South African Renal Society, so he said "What theme?" I said there's going to be a lot of rich people there. So he said "I know what to do." So he showed all these slides, of course, of children dying of renal failure and now not dying of renal failure. Nothing has changed, and it was very good, and a lot of money was raised by wealthy people. Johannesburg did have a lot of wealthy people, not so much anymore I guess, and later in the week we had the renal society. So I remember with him one anecdote that was stuck in my memory, we went to the Kruger National Park, he and his wife, and the urologist there, and me. Oh no, and

also the urologist's little boy and my little boy. So we were in a big, in a van, and we had a wonderful time a Kruger National Park, you know, just the most amazing place to go to. It is now Sunday afternoon around 12 o'clock and their flight's around 5:00, 5:30, and we are about 2 hours away, so we drive for about 2 hours and the someone looks at the sign and the driver, who is Louis (s/l) Kesselt, our urologist, was going in the wrong direction.

DWM: Oh no!

NL: Not in the opposite direction, but obliquely in the wrong direction. So it was going to be very questionable whether we'd make it. So George Schreiner, as everyone knows, the most genial of people, there was ice in that car, complete ice for about an hour and a half. And I called my wife, and I said you have to go to the hotel room - they hadn't packed, and pack completely for them, and take all their clothes to the airport. And he arrived in his short pants, going to Cairo, I remember, and he got on the plane 10 minutes before it left. We talked about that for many years after. I would see him, you know for years and years after that. This is 1966, and we talked about it forever, or '67, I can't remember.

DWM: Making the mad dash!

NL: _____ So then I left South Africa with many mixed feelings about leaving and then started a new life in Chicago.

DWM: At the Veterans' Administration Hospital.

NL: _____ and Research. They changed the name afterwards to Lakeside because it really, I don't think was a research hospital anymore, but it was wonderful to be with people like David Earle and Francesco del Greco, and I mean there were a lot of other people whose names have slipped my mind.

DWM: So what was your work there?

NL: I was the head of this new division.

DWM: Yes.

NL: And having to start a brand new dialysis unit, which was very different from back in South Africa, in that two years, there was now chronic dialysis, using English machines.

DWM: Very interesting.

NL: They already, everything had changed in two years. Ben Goldberg had got everything going and now they were treating maybe 40 or 50 people.

DWM: And the chronic dialysis, they were then, I would imagine, using the shunt.

NL: Yes.

DWM: Using the Scribner shunt?

NL: Yes, oh yes, or maybe already the fistula.

DWM: Fistula?

NL: I can't remember when it was. I think very likely.

DWM: Yes.

NL: And there were, it was going on in the Baragwana Hospital, which at that time was a completely African hospital in Soweto. It wasn't named Soweto in those days, which at that time already had the largest dialysis unit in Africa. I think there were over 50 patients treated there.

DWM: In the late 1960s.

NL: No this is already between '65 and '67.

DWM: Amazing.

NL: Amazing really.

DWM: Yes.

NL: So when you think about it, the Soweto hospital, if you ever go there, is quite unbelievable. It is a very large hospital now. It always was. It had 3000 beds. It was set up by the British in the second world war to deal with injuries. So there it was, you know, in the middle of this absolute trauma-full emergency room, where on a Saturday night there could be 100 severe traumatic injuries. It was unbelievable to see them work there. Anybody who has trained there, you put them anywhere else in the world, they can handle any, truly any kind of emergency and there are many South African doctors who have been trained there. I mean they can do anything because it is just remarkable. But there was dialysis there, and shortly afterwards, transplantation.

DWM: Amazing.

NL: So it was very, very good.

DWM: Yeh.

NL: The university and the goverment in this case, put nothing in the road of progress there. So then coming back to Chicago, my head nurse was someone who I treasured in my mind to this day, although she and her husband were my friends, and have been all these years since then, because she was a nurse who had never seen dialysis, who just took to it and almost instinctively knew what to do, and she was so good at cannulating. She just set a tone. That whole unit ran very, very well. After a year or two, we recruited Peter Evanovich, who is a very well known nephrologist and he took over the actual running of the dialysis unit from me.

DWM: Let's talk about starting that dialysis unit. So you come to this hospital, then the VA Hospital in Chicago, and you have to start a new dialysis unit. Did you build a building?

NL: Yeh, it was a whole floor.

DWM: It was a floor in the hospital?

NL: Which we designed, yes.

DWM: Yes, and so what machines did you use?

NL: I wish I could remember. I know we used the, in South Africa they are using the Kiil, those big Kiils that had to be made up each time. I think we were using the very earliest hollow fiber dialyzer, but I may be wrong. No, no that's not true. We were using those Kiils. You know what they were?

DWM: The Kiil board.

NL: The Kiil boards. That's what we were using.

DWM: Describe to me what you remember about the Kiil board.

NL: What I remember about it was that we had to take the whole thing to pieces and clean it, and spread the membranes very carefully over them. That's what I actually remember about them.

DWM: Who would clean them and set up in those days?

NL: We had our technicians.

DWM: A tech that would do that?

NL: And I was, you know, in those days everyone was involved in everything because I didn't know, it was a terribly stressful existence because I didn't really know very much. Dr. del Greco had done some dialysis already. He was a very helpful man across the road at Northwestern, but you know, there was sort of a limitation on how much I could ask of anybody else.

DWM: So you all were using Kiil boards.

NL: Yes, Kiil boards.

DWM: And the machine would have been?

NL: I can't remember the machine. I think they were probably Baxter machines or maybe the next version of the recirculating RSPs at that time.

DWM: All right. And a shunt or a fistula for access?

NL: Yes, shunt or fistula for access, yes.

DWM: And what types of patients were you seeing? What were the diseases for these patients and how were they doing on dialysis?

NL: Well these were veterans mostly now, of course. But not entirely and I can't really honestly say I remember the cause of the disease.

DWM: Were they pretty healthy generally, other than their kidney disease? Was there a selection at all about them?

NL: No, no, no, no, no.

DWM: Or you were dialyzing all comers?

NL: We took everyone until we were full because you know we had to fill up the space. It was a big unit. I think maybe 20 stations.

DWM: Wow, that's a very big unit in the late 1960s.

NL: Maybe it was 15. I don't know. I had to tell you a story but it was large enough for me to look at it with fear and wonder.

DWM: So all comers. You're government supported through the Veterans' Administration and...

NL: Yes. Restrictions were minor, you know. I lived in an era for about 20 years where I wasn't restricted. It's only in recent years I've really been restricted by anybody, so it was a very fine experience, you know. We tried all kinds of things _____. We had no idea really how to dialyze a patient. What was the quantitative approach to dialysis, because it was two years before Gotch, oh, before Gotch even started to think about kinetic modeling. It was two years earlier, '67.

DWM: Well it is one thing that a lot of people have talked about in taking care of patients at the time, that there was a lot of observation and decision making. Would that have been true for you? I mean were there sort of standards of care, or did you look at every individual patient.

NL: We focused so heavily on every individual patient because we didn't know what we were actually doing. My idea always was to do this, to give them more than this, the most possible because after all the amount of clearance you got out of these things, compared to the human, we often used to do that comparison. It was like in a week, something like 10%, I think; 10% or 15% of the amount that any human kidney would provide. But we were very inexpert in taking fluids off. There was none of the advances of moderate technology where there is a balancing chamber and you know you can prescribe it to the millimeter, _____ depend on transmembrane pressure and inaccuracies - machines would sometimes take off 3 liters and at other times not take off, so there was a lot of that going on. You know, looking back on any young nephrology fellow seeing it today would say really, this is just awful. You may as well leave these people alone but it is funny though, that I just remember coming to work every morning, leaving every night, with a feeling of thank goodness we've got through this today and I hope tomorrow will be just as safe. You know, that kind of feeling all the time. Because there were so many ways in which errors could occur, so many ways and disasters. But that was for four years guessing. I guess it wasn't ready in '67 and it was probably '68 that it really started. They were the most formative, I would say, in terms of personal responsibility. Because up to then I knew certain things pretty well, but how to run a chronic dialysis program was certainly not one of them. The VA then began to become organized and they got people together, so we learned from one another. It was pretty good.

DWM: Yes, let's talk then a little bit about that late 1960s and early 1970s and who were you talking to? Were you going to meetings at the time? Where were you learning about things.

NL: The ASN only began in 1972, so there were meetings and the big thing was there was the chronic kidney disease program of the NIH, I'm not sure if that had started already but that was a very important program, where a lot of the technology of today comes from, chronic kidney disease program. It stopped after some years, which was a terrible...

DWM: What did it do? What did...

NL: Oh, I see what actually things did it - first of all it produced understanding about machines and things like the actual sensors of machines, the pumps of machines, hemolysis, blood flows, that kind of thing, dialyzer design. There were, you applied and you got money to develop technology. But the big meeting I remember was the Association of Artificial Internal Organs, that was the big meetings and those were wonderful. Schreiner was the person behind it. He would deliver all the minutes, not the minutes, you know, the proceedings within a few weeks of the end of the meeting. It was spectacular and miraculous, and that's where Scribner, of course, first presented his...

DWM: Did you ever see Scribner speak, or...

NL: Yes! Oh yes, yes.

DWM: What do you remember about Scribner?

NL: I remember he was a dynamic believable man. You wanted to believe in what he said. I had another connection with him indirectly because Thomas Bothwell, who was one of the world's experts on iron metabolism. His book was a classic, Bothwell and Finch, who went to Seattle. Bothwell and Finch. That book on iron metabolism is a classic and he told me all about Scribner. This is back in the period between 1962 and 1964, when I back in South Africa. So I knew a lot about the man because he was idolized, I think, by most people who knew him. He was really a wonderful figure and you know, he was so prophetic. He is the one, do you know the name Eberhard Ritz?

DWM: No.

NL: Eberhard Ritz is the president of the International Society of Nephrology now, and a very important figure in nephrology. He, for a while in JASN, had a column, had a part of it, where they reprinted classics and in one of them, he reprints Scribner's ideas about extracellular fluid volume and sodium excess, which is one of the most important things Scribner wrote about all his medical life, and was never taken seriously enough. That's why I said to you at the beginning of our conversation that I grew to realize that this was vital. And he points out how Scribner's so much ahead of anyone else, in showing that hypertension, heart failure, was linked with this phenomenon. That was in 1962. It is in the proceedings. It is so amazing that at our meeting

just last week, Dr. Ritz again pointed out one of Scribner's early suggestions, which I have to look up to tell you, but it was another of the things he wrote about 40 years ago, which has proved to be correct.

DWM: True.

NL: It had to do with, I remember now, he suggests that there must be some kind of substance, which the body reacts to when there is sodium excess in the urine, to increase sodium excretion and you know they have now found there are cardiotonic steroids, which in fact do that. So this man was quite remarkable. If I can just jump ahead?

DWM: Absolutely.

NL: I met Frank Gotch in 1975 for the first time and he already had, he was already the, made his reputation and had already completely developed the idea with John Sargent, of urea kinetic modeling and the word Kt/V was theirs and has now spread everywhere in the world. So he told me about it. I knew about it peripherally but I didn't understand it, and I had a fight with him within the next first half hour and he is my dearest friend now, because I said well what's the point of knowing the "t," if the patient is overhydrated, and that was our fight. And of course, he wouldn't say that wasn't important, because it was, but the accent was on giving enough of a dose of dialysis. Now Scribner didn't approve of Kt/V, as a means of prescribing. He did not think it was necessary, nor was it based on an appropriate backdrop, and on the other hand, Gotch didn't approve of Scribner's reliance on fluid and the sort of mythical things of surface area, that surface area hypothesis, because it was so vague. So they never actually, I don't think, ever reconciled on this issue, which was quite sad, because they were both correct.

DWM: Yes, both correct. That's right.

NL: And it never worked out appropriately. I think this won't be able to print. I nominated Dr. Gotch for the Scribner award the first or second year it was awarded and the story came back to me from the committee that Dr. Scribner didn't think that was a good idea. He got it the following year. He didn't object very long, but...

DWM: Just that one little bit, he just couldn't do it.

NL: Yes it is very interesting, that interrelationship between the two.

DWM: Yes, and very smart men.

NL: Very smart men, yes.

DWM: The ASAIO meetings then, early on, you found them very helpful, very important, wonderful?

NL: They were wonderful, very. They were the only place really where you learned what was going on.

DWM: Yes.

NL: Peter Salisbury was the name. He was one of the founders, if not the founder and I had the pleasure of meeting him somewhere in Southern California many years later, and we discussed it. I think he was the founder, if you could check on that, whether he was...

DWM: I can definitely do that, Peter Salisbury?

NL: Yeh, I think that was his name.

DWM: Okay.

NL: It was very exciting and you know, looking back on those volumes, and I would give a lot of money to have all those volumes - I wonder who does, because there are many, many, you know. Obviously the current meetings are in a sense a shadow of their former self because there are so many other meetings. There was nothing else in those days.

DWM: Yes and recently someone said that the ASAIO used to be very dialysis/artificial kidney-oriented and now there is a lot of other interests of ASAIO, besides dialysis, as well.

NL: The heart.

DWM: Yes, the heart.

NL: But it, and Eli had a good deal for keeping it alive, actually. He must have spoken to you about his...

DWM: Yes.

NL: ... and I think that we owe him a great debt. It is a good place now we send our abstracts there. Our fellows get a chance to participate. It is an avenue that is much friendlier than the ASN.

DWM: Yes.

NL: I don't know about you. I don't like the ASN. I don't.

DWM: Well, the ASN is so huge now.

NL: It's huge, yes, but...

DWM: It's very difficult to do anything useful.

NL: ... but there is an holier-than-though attitude about the ASN that I can't easily tolerate.

DWM: Yes.

NL: For example, to give you an example, our meeting. Our meeting, which I am very proud of it. I think in dialysis, it is one of the best meetings in the forefront of ideas in dialysis. The ASN sponsored it, just putting their name to it for years, and then one day I got a letter from the president who said that because it was not sponsored by an academic group, they were not prepared to sponsor it any longer and although I'm apt to say that RRI, the research is certainly not-for-profit and is certainly separate, officially and legally, RRI is not a separate group.

DWM: Right.

NL: It is a for-profit group, unfortunately.

DWM: Right.

NL: And I pointed out that it's surely the content that counts and who speaks and so on, and especially in these years where CME is so tightly looked at; however, and you can't say a word that is not appropriate, and I hated that. And then their membership lists, you know, I thought for my purpose, they could give us the most up-to-date list but they would always give us last year's, so half the things you sent out would, you know, come back. Everyone's moved. It's little things like that over the years, and I've had other problems with them, too, and I don't like it. Even though I was present at the very first meeting in San Francisco.

DWM: Do you remember that first meeting of the ASN? What was that like?

NL: Oh yes, yes. There were about 400 people there as I remember, that's all, 300 or 400 people.
DWM: And what were they talking about? Why did they decide to meet?

NL: Oh, see I don't remember that. It was mainly physiological. There was, I don't think there was anything on dialysis that I could remember at all. I went with Ralph Repkin, who is now at

Stanford and made a reputation for himself on insulin handling in the kidney. There was no place to stay, and although this may be partly apocryphal, we came very late at night and we went to this place, and we woke up in the morning, it was all red velvet curtains and apparently it was a bordello, although that's what they sold us. Maybe it wasn't but it was just Ralph and me, Ralph and I, I should say. Not on beds but on couches. I remember it was really a very unusual place.

DWM: So the late 1960s, early 1970s, you are in Chicago running a dialysis unit.

NL: And a nephrology division, you know beds and fellows and some of my fellows were very distinguished people. One was, terrible, I can see him. He grew up to become the head of the Post-graduate Nephrology Institute in Chandigarh, in India, which is one of the two major places for training nephrologists in India, the other being the All India Institute. He was one and there were quite a few. I can't remember their names, but they did very well. I've had very good fellows over the years at different places. Dr. Allen Nissenson always says I made him go into nephrology and Bob Bennett, I think was one of the people I may have influenced also to go into nephrology, while I was at Northwestern. I did a lot of teaching there. I _____ forget a great deal of teaching because I was on the faculty and I always enjoyed teaching, although I think it took me many years to become a good teacher, you know, to groups, and even then I think I need a coach, something I was thinking of getting one of these days, if I live long enough.

DWM: So what happened to you after being at the VA?

NL: Well the VA was headed by an authoritarian person. He was about 6'7'' and I think he was chairman of the American Board of Internal Medicine, and he was very authoritarian and at this stage in my life, I felt that I didn't like it, so I saw an advertisement in the paper for a nephrology job in Detroit. Detroit in those days had just recovered from those riots where there were tanks in the streets and good jobs were many, and it was at Wayne State University, and also there was another job at Henry Ford Hospital, so I went to the appointment at Wayne State and they really had nothing that I was interested in. It was almost anti-intellectual, but I had this other advertisement and I called the Henry Ford and Richmond Smith, and old-style patrician-kind of man and I said I happen to be in the area, could I come over and he said "Yes, come over," and that began a real love story with this place that lasted 18 years and was certainly the most important part of my life in terms of medicine, because after speaking to Richmond a few hours, I never called him Richmond to his face in the 10 years or 12 years he was chairman, he said "Well what we want to do is establish a new nephrology division. There isn't any nephrology." Henry Ford, you know, has had a very good history. Henry Ford first founded it, as a copy of the Mayo Clinic, when the hospital committee that he was chairing in 1916 went bankrupt, the idea of the hospital, and the money they had, there was no money, and Henry Food took over this little committee and he said he would found his own hospital.

You know at that stage, the Ford Motor Company was well on the way. So he went to the Mayo Clinic because everybody knew that was the best place to go and he spoke to the Mayo brothers, and he came back and he founded the Henry Ford Hospital with a subtle twist, a very subtle twist. Instead of the doctors being in charge, the Ford family would be in charge and that's how it ran for its beginning. Doctors were in a secondary role, as they have remained ever since. You know the Cleveland Clinic, interestingly enough, also was in charge of doctors until the last 5 to 10 years, now it is run by administration. So he was interested in everything, Henry Ford, the first, although I obviously don't know anything about the details of that. I knew he was very much against smoking and if he saw someone smoking through a window, he would fire them immediately. So, Richmond Smith and the board said "You can do anything within reason," so really it was an invitation beyond anything you could imagine nowadays. I first recruited one of my ex-fellows from Spain, who had been at Northwestern, Pedro Cortez, who is now a very well-known man in diabetes research. And he he's stayed there ever since. He's been there ever since. He came 3 months before me, because that was convenient for him, and he's been there ever since. And you know, I have to say that we used to go home together in the evening and say to each other we should almost be paying them for the fun we're having. You know, in a few years we were able to build up a large floor, we were able to build up dialysis units, acute, chronic, PD.

DWM: So what did you start with at Henry Ford, then?

NL: We started with the ward.

DWM: You had to build a dialysis unit. They had no nephrology division, no nephrology ward, no dialysis unit.

NL: No nothing.

DWM: So where did you begin?

NL: Well we began by the ward of course. To make a, to have a, to find a place where the nephrology patients would go, and then we did acute dialysis, and then I copied what I had learned from Northwestern, and we set up a chronic unit. And then over the years, we actually at the end had done, we had 1200 patients. We had a huge program by the time I left 18 years later. That was probably, that was in 1972.

DWM: Now in 1972, when you have stepped out of the VA environment, and you are at the Henry Ford Hospital and you are talking about taking care of nephrology patients...

NL: Yes for the first time paying patients, by the way.

DWM: Paying patients, yes. Were you thinking about or impacted by the public law passing in 1972?

NL: It was just the right time. Like I told you at the beginning, I just always was very lucky and things just happened at the right time. That made all the difference. Now, instead of it being a, you know, a question of privilege or where you were as a veteran or not, now it was open to everyone. So that's how we could grow so rapidly.

DWM: And were you able to dialyze everyone? I mean where there choices that you had to make?

NL: Well for a very, for a brief time only. For a brief time only. I can't exactly say how long it was, but it wasn't very long and you know, there weren't, we, it's hard to describe exactly how we would go about it, but the selection would probably be made at a different level because if they were not referred to us, then we wouldn't really be in that position.

DWM: So the general practitioners would preselect for you, oh, that you would have diabetes, you're too old...

NL: Too old, too sick, yes.

DWM: Yes, and so you would never even see them?

NL: See them. But you know we would know, after a while we would get to know. But then Henry Ford itself, I don't know how many doctors there were then. Now there about 700 or 800 of them, so you can see, and that's why it was such a good place to practice and this would be in brackets, if you had any kind of problem in the world in your patient in front of you, you could call some one or they'd even come down and you'd have it solved right then and there. When I got to New York, which was my first slap in the face, and I had to get an opinion two weeks later from, it was hard to take, and I've never got used to it. I have never got used to practice. And fortunately I never had to earn a living practicing in New York because I would have starved, I'm quite sure. So anyway we set up clinics, hypertension clinics and these, and then the big thing came when two things that happened. One, Stanley Nelson, who was related to the president of the American Hospital Association, was an absolutely revolutionary man, and it was his idea to work out the idea of a large hospital having satellites, and Henry Ford has now about 30 or 40 of them all over. And the very first satellite was our dialysis unit in Detroit. Do you know about Detroit at all?

DWM: No.

NL: It's about 20 miles away, 20 miles away was our first satellite dialysis unit, and then we had a whole string of satellite dialysis units. That was very exciting. And that helped me understand how you can deliver care, remote from where you are. You know, how to plan things with people, doctors, nurses, social workers, dietitians, everything like that.

DWM: Well we haven't, I haven't talked about that very much with other people, that the time where you moved from sort of direct patient care, which most physicians would have been very familiar with, which is you have a patient in a hospital, in your clinic - you take care of them vs. this emergence of the dialysis industry where you have a remote unit and you have a team of people and an administrative structure that can manage a team of people. Can you remember making that transition? I mean was it a thought, did you think through that process of going from this understanding of medicine to recognizing that you have to reach out into remote areas and manage teams of people providing patient care?

NL: Well I had the model from Stanley Nelson of the idea of having this remote control, but you know as I hope I have intimated to you already, I've always believe in using people better than me and who know more than I do, as being the prime way of doing anything. I mean I do believe strongly in that, that if someone else can do it better than me, let them do it. I'll do my best, but if I can find - so I was very lucky, I had an administrator, who is now a friend of mine, Linda Donald, came on the scene and it's funny and she always held it against me, she was my third choice for this particular job. My first choice was a woman who ran the network. You know about the, you know the End Stage Renal Disease Networks?

DWM: Yes.

NL: She was the one who ran the one in Michigan, and she was my first choice. My second choice was my head nurse from Northwestern, and they both turned me down, and then I went to Linda, who was a school teacher and then became a dialysis technician, because there was no room for school teachers in Detroit. She had married and had moved to the Detroit area, and so she, now she is a master administrator and just as a few words about her, she became the administrator of our program there. She then, when I moved to New York in 1988, some 3 years later she became our administrator here, and then Fresenius took her and she was at one time, responsible for the whole West Fresenius unit, North Fresenius unit and their disease management program, which is about 35 to 40% of all the patients in the United States.

DWM: It's huge.

NL: And so she did that. So I chose, I got the right person.

DWM: Eventually.

NL: You see I'm right in saying I really got the right person. So she was the, so she recruited people. And I mean obviously I've studied it, and when I was with the RPA, I was able to put this kind of knowledge to good effect. And by the way, I do want to ask you something, which I must remember to write this down, because I have to give a talk at the RPA, let me just write it here so we don't forget, because this is now taking advantage of you. Not that you are taking advantage of me, I'm talking about...

DWM: Yes, turnabout.

NL: So that is the answer to the question. And so, that was the one thing was this outreach, but the other was transplantation and that was absolutely wonderful.

DWM: Yes, let's talk about your earliest memories of the transplantation issue in America. You can start in South Africa, yes.

NL: In South Africa, there is this interesting story actually.

DWM: Yes!

NL: The head of the transplantation, I've forgotten his first name, Myburgh, had trained in the United States and he was very familiar with transplantation but the hospital didn't feel that he could undertake it by himself. So he wrote to his old friend, Tom Starzl, who is my second medical hero, after Ben Goldberg. Stazl came. Did you know him in his early days?

DWM: No.

NL: He was a very handsome, very attractive personality, very modest, and the kind of humility you know, that he is immediately endearing, and I think that was partly an act because when he had to be, he was a very different man, but I really did like him. So this is what happened. He made a big impression. He arrived on a Saturday evening and I met him the next morning with the whole team, the dialysis team and the transplant group, and he immediately announced that he wanted to know who was going to the donor nephrectomy of the first patient, who was my patient. I was like the assistant head of the division at that point. So it turned out to be Dr. Yerdon, who was head of urology and a very, very strident and outspoken and aggressive man. He was a small man and very aggressive. When he met Starzl, they were quite friendly, then Starzl said, "If you don't mind, I'd like to see you practice a donor nephrectomy in the autopsy room," and Yerdon says, "Are you out of your mind? I don't have to show you how to." Eventually, as you can image, he did. He had to do it, otherwise there would have been no transplant, Starzl would be going back. So just a small point of what happened, the operation went off very well on a Monday and the next morning, I went early because I thought I should know everything about the patient before Starzl comes, so I was there about 6:30. So I walked

into the room and they said "Well Starzl's been already and gone." I felt very bad and I apologized to him and I said I'd come earlier the next day. The next day I came at 5:30 and he'd been. There was no way you could ever beat Starzl because he was an intensely competitive man. I remember saying to him, "Tom while you are in this country, you should go to Cape Town, which is an absolutely wonderful place." It is, it is I think the nicest city in the whole world that I've seen. And he said "Well maybe one day." So some years ago I met him at a meeting and he had just come back from South Africa. There had been a meeting in Stellenbosch, which is about 20 miles from Cape Town, 30 miles, I think on cardiac transplantation, and I said Tom "Well how was Cape Town." He said "I didn't get to it." He remembered. I think he did get to it. He did go but he wasn't going to tell me that he went.

DWM: Oh, I see.

NL: So the transplant program began and it was very successful and has been over the years because it is much cheaper than doing dialysis in South Africa, but to come back to Henry Ford, so we began. The surgeons were trained and we had the University of Michigan was out teaching hospital in those days. My academic position was there, which is very nice because Wayne State really didn't compare in academic and in those days those things mattered very much more than they do now.

DWM: Yes.

NL: So the program went really very well, except the following. The surgeons were very good surgeons but I had no guarantee that they would do a good job otherwise, so I know this sounds very bombastic, but we actually insisted on being in the operating room, the staff and fellows, every operation, and staying in the intensive care unit, and that we were responsible for the care of the patients except for the purely surgical. And the surgeons hated this but really they had no choice. And slowly they whittled away at our authority and eventually at the end, we were only responsible in the outpatient clinic, but it took a couple of years and I insisted on that, so any fellow who was at Henry Ford in those days remembers how we used to stay with the patient all the time.

DWM: Yes go there.

NL: And we would find things that they were doing wrong, you know not completely for nothing. So those were very good days and we at one time had more transplants than the University of Michigan with their enormous amount, for a year or two, doing about 80 to 100 a year.

DWM: And they were pretty successful in your recollection. You know a good record, yes?

NL: Yes, yes, we had a good record. It actually happens that there had been a transplant done in the 1960s, that's 10 years earlier, by a Hungarian physician who was very famous, his name was Zalogi, for doing the first abdominal aortic aneurysm. He was the originator of that operation, Zalogi. He was a very smart man and I used to talk to him, he liked to philosophize. He said you can always tell a Hungarian. I said how, he said "If you and a Hungarian enter a revolving door at the same time, the Hungarian will always come out at the other end in front." That was his, so it stuck in my mind. So that stayed for a long time. I paid a price for my opposition to the surgeons. We had a running battle those years, a real battle in that, and I'm so happy that it happened that way, that I was nominated to be the chair of internal medicine.

DWM: Yes.

NL: And the chairman was, or the selection committee was the surgeon, so I was told later that it was actually a vote on one or two and several surgeons there, and he voted against me, and so in retrospect it was the worst thing that could have happened to me. I'm not made for that kind of job and I wouldn't have like to have done it, but at that time it seemed good.

DWM: Yes.

NL: So that was that. Henry Ford was a wonderful place. We did a lot of research and we did a lot of clinical care, and the spirit was wonderful, and there was no, I mean obviously Mayo and Cleveland are maybe better academically now, and Scott White Clinic in Texas is similar, I think.

DWM: Yes.

NL: Yes, and Lilley? Lilley?, Lahey, Lahey Clinic, but it was terrific and if I could practice like that, that's the way to practice medicine, in my opinion.

DWM: Yeh. So why and when did you leave there.?

NL: Well, I left there because of several personal reasons. My wife and I were getting divorced then. That was not the main reason, I really had no reason to because we have remained excellent friends ever since then. I don't know, I guess I had had enough of that. We had reached a peak really. Not a peak, a plateau, not a peak, and I guess it was enough. I think, I don't really know and again, I was very, very fortunate. I did something, you know, thinking ahead, here I am much, well over retirement age, but in those years, I started thinking of retirement. I don't know why, so I thought look, I've made no money and maybe I can make some money and live in New York. So a man offered me a job. He was the originator of, oh, reuse I have to tell you about!

DWM: Oh, yes!

NL: Reuse played an important part in our success. Because we did reuse very early on and in fact in later life, I actually originated a new method of reuse, but reuse played a very important part and because we were able to cut costs tremendously, dialyzers were very expensive in those days.

DWM: Yes. So let's talk about exactly reuse. When you started reuse, what dialyzer would you have been using?

NL: Hollow fiber.

DWM: Hollow fiber, and about, do you remember how much you would have been paying for it? Why did you decide to...

NL: Oh about $15-20.

DWM: Okay. So what year was it that you decided to begin reuse?

NL: It was probably about 1975, is my guess, around there, maybe even a little earlier and it was very much trial and error. This man that I'm referring to whose name I can't remember, had started reuse and had had reuse meetings going on, which I hadn't attended, and so he was actually I think the pioneer of reuse. So that cost, we got a big award, the division, from Blue Cross Blue Shield for saving all that money. We were saving, you know, huge amounts of money because if we had 500 patients, you can imagine how much it was.

DWM: Right. So what was reuse like? What did you do to reuse?

NL: We reused with formaldehyde because NMC had already started to do this - National Medical Care and we just copied what they did except our water, we took more care over the original water, which to this day we do. And our albumins were always much better than Fresenius. We were able to compare. I think purely because our water had less endotoxin in it. There was a wonderful guy called Ronald Easterling, no one would remember now, at the University of Michigan, who was the most important person in the chronic disease and detoxification committee of AIME, where I spent many happy years and John Sadler succeeded him many years later. John Sadler is someone I admire. I'll tell you about him later. So it was Ron Easterling who we worked with and so we had this reuse program. Anyway, I stayed with AIME from, I guessed I must have joined in 1975, I guess, something like that. I've been a member ever since, maybe I'm exaggerating. Maybe it's a few years later, but Easterling introduced me and I became the co-chair of the reuse part with the commercial person, that's how the chairs work, as John must have told you. Just a word about John - what impressed me enormously about his long stewardship with this committee, which as he must have told you

members of every single branch that could be interested you know, users, providers, industries and government, FDA, everyone, if there was one vote during those many years, it was one more than I remember. Everything moved by consensus. He got people to agree on everything. I think it is a wonderful trait.

DWM: It is an amazing quality.

NL: Isn't it a wonderful thing to be able to do that?

DWM: Yes.

NL: So I admire him intensely, as well as being a very feeling individual.

DWM: Yes.

NL: So anyway. So now this man offered me the job and he had dialysis units in different parts of New York. He said I could have a completely free reign. My idea was to have the highest quality units, always been in my mind and I'll tell you about Amgen later, who that nearly happened. Amgen and DOQI. That all arose out of that same business. It's funny how things work.

DWM: Yes.

NL: So, you know I had terrible mixed feelings and I felt I had betrayed myself. It was one of those terrible moments and I think I was very depressed as well. It was a, and so I took, you know, I agreed to that. I met his lawyer, I went through signing contracts and with me, I now had the person who was my first choice for the networks. She was now head of the network in Virginia. Is it Virginia, I think so in Virginia. No in Washington. Is that the Virginia network?

DWM: Yes it is, yeh.

NL: And I offered her the job to come and do this and she said yes, so we came together and then the following happened. I was supposed to move on a Wednesday. On Friday afternoon, I got a phone call from him. He said would I please meet him on Sunday morning for a meeting at the Regency Hotel at 10 a.m. At this stage, I had already made my academic arrangements with Beth Israel Hospital because Tom Killop, who was the chairman at Henry Ford in Detroit for many years, and a well-known cardiologist, was now chairman of medicine at Beth Israel, again another person of luck, you see. So I asked, because I thought we were going to discuss the details of how we would work within an academic environment, which I insisted on, that I could still have an academic environment, so we got in this room and I'll never forget it, it was a long room with lights above, lights down and in comes this man and I wish I could remember his

name, and his psychiatrist. He introduces him as his psychiatrist, and the chairman of medicine now was with me. So we set around the table and then this man, I terrible not remembering his name, says to me "I'm sorry to tell you that I've come to tell you today that I can't go through with this. I just can't give up. I just can't give up, and you are very welcome to work with me, except I'm going to be in charge." And his standards weren't good. So I was really, you know, destroyed for a few minutes. So we leave the meeting and the man says to me, the chairman of medicine says "You know the job at Beth Israel, head of nephrology is available and we are recruiting for it just at this very moment. We have selected someone but we haven't told him. If you want to come, you could come and that's how I immediately transited in one hour...

DWM: From one job to the next.

NL: To the other. So that was just amazing, I have to say. You'll agree that I've been luckier than most people, wouldn't you?

DWM: I would, I would say that you have certainly been open to being flexible to looking at the good side of what comes your way!

NL: Well that could hardly be bad thing.

DWM: But certainly that is remarkable, in one hour, to change from what you thought was your job to being head of the division at Beth Israel, yeh.

NL: The person who didn't get the job, actually in later years, I got to know very well and he would have done maybe a better job than I did, I think. Anyhow, that's...

DWM: So you come to Beth Israel, and what year would that have been?

NL: Oh that's clear, 1988.

DWM: 1988, okay. All right, we were just talking about Beth Israel.

NL: Yes.

DWM: Yes.

NL: So Beth Israel was the division of nephrology chair, chief actually they called it, and I don't think I did as good a job as I could have because I was really becoming involved and the RPA was overwhelming, I was the president the year I moved.

DWM: Yes. Do you remember when you first got involved with the RPA? What year about would that have been and why did you get involved with the RPA?

NL: I got involved with the RPA not because of the immediate objectives of the RPA as they initially were. You know it started off really as a lobbying organization with the original people. John was one of the people who had a different way of looking at things, but the original people were mainly interested in protecting their financial interests, so maybe that shouldn't be in that document please, not in final, but by the time I got involved it was at least 5 years before because I must have been a member of the RPA board for 4 or 5 years. I don't know through whom it was. I can't remember now. Louis Diamond had a big influence on me. Do you know Louis Diamond?

DWM: I do know Lou Diamond. Why was he influential for you?

NL: Because he was the chairman before me, the president before me, and he was very helpful. He was very much more attuned to politics than I was, I think a certain amount of naivete, to say the least.

DWM: So what was the interest for you with the RPA?

NL: I was undoubtedly to further the care of patients. I mean it sounds so trite. It was always my interested in the RPA to try to go along the lines of improving care whatever government could do to improve care and of course, I actually learned the financial aspects and I did, and in fact, I'll tell you this one story, which is really a good story, I think, which affected nephrologists for many years and no doubt affected you, too. I remember they asked me to be the president the year before Louis, the year Louis did it. At that time half the country were being paid for acute dialysis on like a $12 per treatment and half were being paid for a treatment of like, some were getting as much as $500 per treatment. So there was a committee of the American Medical Association, which made recommendations to HCFA in those days. I've forgotten its name. You see there are so many things I've forgotten, unfortunately, but those are, it's available. So Louis and I were at this meeting. And we, Medicare does not allow for you to have gradations of severity. You don't get paid more if you have more severe illnesses, you know. So what were we going to do when someone was really acutely ill, as opposed to acute renal failure in the hospital where they are not ill at all? So Louis and I went out, and I'm not sure which of us said this, I don't remember. We said maybe we could do it on the basis if someone is sick enough to have to go back and be seen again, after you originally made the treatment plan, then that is worth more money. And it just came to us, went back and they liked it, so that is why there was this two-tier system until recently. I may have disappeared now or it is going to disappear.

DWM: Right.

NL: So it happened as easily as that, and when I think about it, how it was misused you know, how many people misused it by just going back without real documentation over the years.

DWM: Right. But John Sadler also talked to me about the fact that early on, when the government was trying to figure out how to pay for dialysis, that there were people who were very involved and they would go to people like John Sadler, or you and Lou Diamond, and say, you know "How can we decide about this reimbursement," that a lot of the decisions about reimbursement came from people's experience or suggestions and...

NL: Um hm, exactly. Oh exactly. Because there was no rule. You know, there was just a question of opinion and wisdom I guess, up to a point.

DWM: Yes.

NL: So anyway, the RPA was a wonderful experience for me. I remember fighting against the NIH, Gary Striker, who is now one of my friends, you know arguing with decisions he had made. I enjoyed it very much. You know, we formed a little club, a very little full-of-itself club, because it - the whole thing lasted so many years because you were a president, a past-president, then there was the foundation, you were the president and the past-president. You know, the RPA occupied a decade of my life at least.

DWM: Yeh. What year were you president of the RPA?

NL: I think it was '67, I mean '87-'88. I think because I know I was in transit at the time.

DWM: And what do you think were the big issues, do you remember, around that time?

NL: Well with the Stark. I remember meeting Mr. Stark was a big issue. You know the Stark rules.

DWM: Stark regulations.

NL: And then this question, of the acute dialysis.

DWM: Yes.

NL: And then there were NIH problems. These are the ones I remember. Lou would be a much better person to do that. And I was also involved in, I remember that the stress was tremendous, I was asked to be the first associate editor of JASN for dialysis, and that was an interesting experience because up until then I had reviewed articles, but I had never been an

editor and I had to really learn quickly to. I think at the end I was okay, but it took me a few years. It was a five-year job and I really loved it. I mean you learn so much.

DWM: Right.

NL: It was very enjoyable. Okay, so that I guess, is that. So, Beth Israel was not, nothing I doubt really special. I had the shock of trying to practice. It really was a big shock, you know, the idea of not being able to refer someone for advice and get an answer back within a reasonable time. The standard of medicine was very good and very competitive after Henry Ford, where you can say that people who are there for a full-time salary aren't the very best, could be argued there well for some people, I think, I didn't apply but large perhaps it might. And the patients, of course, were very different from Detroit. They were far more demanding. They knew far more about the answers and it was good, I liked that. I mean I like to be asked challenging questions. We developed quite a big program pretty soon. Linda Donald came after two or three years and she actually made it expert. We ended up with quite a few facilities, which was Fresenius bought eventually.

DWM: Yes.

NL: And that, we had Johns Hopkins, in fact, in our group at that time. The lady who had given money to Johns Hopkins never new that it was actually owned by Henry Ford and on the day they had the opening party, we were not invited, in case we would spill the beans. She never new that that real estate, it wasn't just the unit, it was actually the physical area was owned by Henry Ford Hospital and why I say Beth Israel, because for about a year, I continued to be the medical director of Henry Ford's dialysis...

DWM: Of Henry Ford, even after moving, yes.

NL: ...because Robert Narins only came the following year.

DWM: I see.

NL: And he and I never got on, I have to tell you. One of the few people I can say that I absolutely never got on with, had some real good arguments with. So, it went quickly and then RRI, how RRI began was very interesting.

DWM: Yes.

NL: Ben Lipps who is the CO of Fresenius, and I think a genius in many ways, a genius.

DWM: He is sort of one of the important fathers of the hollow-fiber dialyzer.

NL: He is named is one of the patentees of the original hollow-fiber dialyzer.

DWM: Yes.

NL: But more than that, you know, he actually saved the whole field by his initial ideas of how the fibers should be arranged, their width and how they should be treated. He was very, he made many contributions.

DWM: So when you say saved the whole field, what do you mean by that?

NL: Because if hollow fibers are not developed as a means of treatment, who knows where dialysis would have gone. They are so efficient. They are so cheap to make and they can be manipulated in so many ways. One wonders how dialysis would have gone without the hollow-fiber dialyzer. They are used everywhere in the world. No one uses anything else virtually. So one day he, Linda Donald and I were sitting at a table. We had been friends since 1975 when he had tried to sell us machines at Henry Ford Hospital. He was a salesman when he had to be, you know. He was a financier when he had to be. This huge deal with NMC, he largely engineered and you never see his picture on any of the, he is always behind the scenes. A very, I think, very really and genuinely modest man. I have been impressed by him all my life. So we were sitting down having dinner and he said, "I wonder what would happen if we set up a group of dialysis units, trying at the very high standard, and that does research, and includes universities, sponsors your research in those universities," and he wrote it all down on a piece of paper and it all happened. It all happened. I have to say that nowadays perhaps, his vision is blunted a little bit in that the research isn't as important as it was, but nevertheless, he gave us the impetus to do these things and this has been the culmination of my life in that, with all these talented people I've had, I think we really examined a number of interesting questions and it has given me the opportunity to be in the Hemo Study and the Choice Study and now the Daily Dialysis Study, which is really very, very fortunate and a wonderful opportunity.

DWM: I want to talk about the Daily Dialysis Study but before we do that, when you first then had the concept of the renal research institute, where did you start? What did you start with? What units did you start with? What people did you start with?

NL: We started off with a fellow we had, who was Danny Schnedlitz, whom I just saw 2-3 days ago. He was first lab director after being a fellow. He's the man, you may not know, but he is the man who first thought of the idea of cardiopulmonary recirculation. That was his concept and he proved it at RRI. So he, we had this little lab. The idea was that Ben had, which he denies now, that - no it's true and very important - that the universities, because of the basic information in other divisions, other departments, would think of things that would improve dialysis, not the nephrology division primarily, you know but infectious disease, cardiology,

biophysics, who knows and that was his original idea. It never worked out. We gave lot of money each year to these universities from the fund that I had been given but very few major developments occurred and our lab, which was originally just going to be a small one, was in fact making far more important contributions (that shouldn't come out here, I don't think). So the money went half and half and I was given $15,000,000 to spend. I spent it all, it was all gone. But I think relatively speaking, it was probably okay for half of it was worthwhile. So that was the idea and you know, you can say. An _____ authority would have to evaluate the value of what was done over these years, but that is what it was basically.

DWM: When you then are at Beth Israel and are involved with Renal Research Institute, and even before that, there are issues in the 1970s of for-profit vs. not-for-profit dialysis.

NL: Yes, right.

DWM: Do you remember your thoughts about that? And controversies about that?

NL: Oh yes. I was very much opposed to the idea of for-profit dialysis in principle.

DWM: Do you remember when you first started thinking about, what made you think about for-profit vs. non?

NL: Well I was right at the beginning of it you see, because (s/l) Merkey had the first storefront operations and this is independent of NMC. This is way back. This is at the very beginning of that. It would be in the, oh my goodness, in the early 1970s. He was already doing something along those lines, before the - what is it, I've forgotten the name of the law.

DWM: Public Law 92603, yes, yes.

NL: Yes that's right 92603, sure. So I was very much opposed to it, and it is ironic of course, that I am now involved in just that but that is not my aim. My aim is the highest quality possible and I am constantly at war with operations, as you can imagine.

DWM: Right.

NL: And always have been. You have to believe me on that one.

DWM: I'm sure that's true. But the big controversy, as I see it, was certainly for people like Gus Hampers and Ted Hager in Boston...

NL: Yes.

DWM: ... that they took a lot of criticism from the press and from the academic institutions about medicine-for-profit/dialysis-for-profit.

NL: Um hm.

DWM: What were your thoughts about that? Did you know them, or?

NL: Well the way it was portrayed, well I knew Hampers, I knew Mike Lazarus and Merrill. I didn't know Hampers very well, although I met him a couple of times, but when I took the job at Henry Ford actually, I spent a week with Dr. Merrill and that's when I first met Mike Lazarus and Mike Lazarus was doing reuse in those days. I remember very clearly. And he has remained a sort of friend ever since. We often differ on things but he is a man with a heart of gold underneath that sort of rough exterior. I think very highly of him. He is a first-class individual. We had big fights over things like Kt/V in the early days, but I think silly things like that. So yes I have thought about it. I mean I have become very familiar with what is involved in profits and loss in a dialysis unit, and I've always wanted to not skimp on anything and have only the best. I mean you have to accept that this is not a self-testimonial but it is an issue. On the question of best though, I want to tell you a story, how DOQI actually arose.

DWM: Oh yes! Let's talk about that.

NL: One day Ken Chen and Donna Mapes, do you know these people?

DWM: No.

NL: Donna Mapes unfortunately has retired now. Ken Chen was, they were both Amgen employees and they, I had known them I guess because I had done speaking things on EPO at one point over a short period overseas. So Ken Chen said "We are thinking of having a dialysis unit that is perfect in every way, that does everything you can possibly imagine" and I said that is the most wonderful idea. And he said "We'd like you to run it" and I immediately said that is just the thing in life I've wanted to do. So about a month later he said "They have decided not to do it because they would be competing with their customers and they don't want to take that chance." About 3 weeks later, I get a call from him or Donna Mapes and they said "We have something we want to do instead and that is write guidelines, sponsor the writing of guidelines," and that was DOQI. So it started off with me and the response in the community was very adverse. How can you allow an Amgen to sponsor guidelines, they said? I said well, if you have good people involved, it will be all right, and Louis Diamond, my friend said to me in public, he said "If you do that," he said, "No one will ever speak to you again." His exact words were. I never fail to remind him of that. Well as you know, it happened. Then we decided that we needed to get sponsorship and the National Kidney Foundation became involved and Gary Eknoyan. That was the best thing that happened because Gary became a leader with K/DOQI

and then with _____, so it was a very fortunate thing again. So that's how that arose and I enjoyed thoroughly all those years and the conflict of interest stories because you know, when we did the PD guidelines, everybody was in the pay of somebody. There was no way we could have done those and I think the best way of dealing with that is the way the House of Commons does, as I understand it, that you just say what your interests are and everyone will judge if you are speaking in conflict or not. I mean, you hide nothing.

DWM: Yes, right.

NL: And nowadays, that's really what is happening.

DWM: Right.

NL: Everyone has to say what their conflicts are. It is open. But yet you should not be excluded, which of course is still a problem. Some things there are exclusions. Based on arbitrary things, whether you have $10,000 or $9,000 worth of stock to me is ludicrous. Because I mean to some people $10,000 is nothing; to some people $9,000 is a great deal of money. It doesn't _____

DWM: Right, yes, it is a very arbitrary number. Well there is no question K/DOQI has been a huge event in the care of renal patients.

NL: Well you know, it looked better then than it does now because of the revolt, what is it, the reaction about evidence.

DWM: Yes.

NL: You know all that story, so it is hardly worth going over it, but in a word you know, the standards of evidence are now so strict that there is virtually nothing to talk about.

DWM: No, nothing that will achieve that. Yes.

NL: So therefore, advised opinion is not completely valueless, so if you had no guidance whatsoever, would you be better off than if you only have the few things that are evidence-based. I mean, sorry, did I say that right? If you only have opinion, are you better off than nothing? And I think good opinion is valuable for a doctor, I'm thinking of myself as a resident seeing a patient and knowing what to do.

DWM: Yes.

NL: And I think some guidance is vital. In some areas it has been extremely useful.

DWM: Yes. One of the things that I have talked frequently about is, well I hear, is that we came from this time of great innovation and change in kidney disease and dialysis, 1960s, 1970s, 1950s, the time of innovation and new ideas, a lot of it was observation and experience.

NL: Yes, right.

DWM: And that perhaps today we rely too much on needing to have a randomized control trial.

NL: You're right. I agree.

DWM: And that observation and experience can be incredibly valuable.

NL: Absolutely, and I think the other side of it, that even the randomized control trial, dealing as it always does with a select group of patients, can in fact be misleading.

DWM: And biased.

NL: And even biased.

DWM: Yes.

NL: So there is no perfect answer to this question but it occupied maybe 10 or 15 years of my life and I loved it. I really did. And I'm just out of _____ now, so I'm completely removed for the first time in many, many years, from all the discussion of guidelines.

DWM: Yes.

NL: And I miss that, I must say.

DWM: I definitely want to talk about DOPPS.

NL: Yes.

DWM: So do you want to talk about that a moment?

NL: Well DOPPS, as you know, arose out of Amgen support following the successful USRDS and I tell you, one of my 2 or 3 things that I am very proud of in my life is that I was the, what do you call it, not midwife, what do you call it when you arrange a marriage?

DWM: Matchmaker?

NL: Matchmaker! I was the matchmaker for the USRDS. I introduced Fritz Port to Philip Held.

DWM: Oh!

NL: And that was my really good achievement because that gave rise to the USRDS, which was, so I was very pleased with that. I have to be proud of it.

DWM: So how did you come about introducing those two?

NL: Because I knew, I had worked with Fritz Port, and I had been Philip Held's advisor at the Urban Institute looking at data. What it was, he was giving me all the data from _____ and say what are the important things. He had several other people do that, like John Bower I remember was one of them.

DWM: Yes.

NL: And so I knew them both very well and I knew that there couldn't be a better mix that I knew of, match. So DOPPS has been something unique and Amgen is to be praised for its support over all these years for it. It has taken the wonderful planning of people like Bob Wolfe, the statistical, you know the way to see that the data is really randomized amongst, in the country and in the unit and all the very intelligent developing statistical ideas. I think it has given us a great deal of information that we could not have had otherwise. I think Fritz has been a wonderful successor to Philip Held and Bob Wolfe in developing DOPPS. So that's, I've been just an advisor to whatever the committee is for all these years and I've taken advantage of them in many ways, slides in particular. So then, that's about the end of the road. Here we are.

DWM: Well before we finish, I wanted to ask if there is anything else you can think of we need to talk about.

NL: Anything I did that was really useful. It's amazing, oh the other things are not true. No, I think that covers it.

DWM: Well there are a few things that I know that you are working on, too, perhaps with Cormedics. We could talk about that or the Human Nephron Filter. Are you working with that?

NL: No, no. You mean David Humes, or...

DWM: Well, David Humes, but have you not been involved some with the filter, the implantable filter? Are you affiliated with that in any way?

NL: I spoke to, had many conversation with Mr. Erman, Dr. Erman, I think he is one of the developers, but no, I haven't. We ah,...

DWM: Well let me ask you this way then, what do you think is the future for renal failure patients?

NL: I think it will move along various ways. The first is that dialyzers are limited in their ability to remove so many of the toxins that von Holder and others have shown accumulate, so we require some other means. I think there is a certain amount of hysteria about leaking albumin. Albumin loss is not really an issue. It's low albumins that are bad due to inflammation, but just having a low albumin is probably not a problem at all. You can only lose so much, so if you have bigger, you know bigger pores, more permeable membranes but I think sorbents of some kind or another are going to come next as a major issue, and I think that is going to deal with, to some extent, with toxins that aren't being removed. And then other means of removing them. It's hard to imagine exactly how this will be done with, as we know more about proteomics and these protein-related uremic toxins. And secondly I think the question of nanotechnology and the ability to have membranes that can be engineered for certain substances. This is very interesting and I've listened with great fascination to the work that is being done by this one company, Biofiltrate or some name like that. Allen Nissenson is, I know, involved with that.

DWM: Right.

NL: And I've been very interested in following that. I was on the advisory board for a brief time, until they realized that RRI was partially owned by Fresenius and that was the end of my participation in that one. It is quite funny. Then I think that daily dialysis, or longer dialysis, nocturnal dialysis must come eventually but with easier machines than we have now, and so that is another big trend that I think is going to occur. I think in the world as a whole, when it comes to trying to cover primitive areas, you have to have dialysis without water and that's another big area for development. I'm sure that's very important. And of course, I want to talk about Tanzania.

DWM: Yes!

NL: One of the main things we are involved in, and this, I don't know you probably better not put it there except perhaps a mention, because it takes a lot of my time and someone will come after me, in Tanzania, a country of 36,000,000 people, there is only one nephrologist and she is trained in South Africa, Linda Ezekiel. Children die there tremendously due to diarrhea and/or malaria, and women, too, with related to childbirth. What I've been trying to set up now is acute peritoneal dialysis, that's why they mentioned originally, just acute peritoneal dialysis with straight catheters, trocars and cannulae, for children mainly, because there is no other

way of treating them, so I have a little group of people, some of the best PD people in the world actually, from Europe and India and this country, and Peter Kotanko is my colleague now, has developed a salivary test for BUN, which seems to work, so we foresee the idea that not every kid who's got oligurias in acute renal failure, to try to test people in villages and regional hospitals, bring them to a central area where they can get acute PD for a week or less and survive. So that's the aim and we are trying with raised money to build a plant, to bottle, to put dialysate into bottles. But that's not a terribly practical thing. To make bags of dialysate is very expensive, so I hope to speak to the companies and see if they'd be interested in providing this resource, and so that is something I am very interested in.

DWM: It's fascinating or amazing to hear that story in 2008 because it almost brings us full circle around to where we were with the world, the rest of the patients in the United States and other developed countries in the 1950s. People are dying and simple things would save them.

NL: Well said. It brings it full circle.

DWM: Yes.

NL: That's very good, I like that. Well, I hope we can do more than we could then. Now we have all the technology in the world, it's just a matter of application, of organization and administration, so that's what I'm very interested in and there are a lot of people interested, like Fred Finkelstein at New Haven, in providing services in Ghana, for example.

DWM: Yes.

NL: But Tanzania is a little easier. It is a stable country, not like its neighbors, and the Minister of Health is interested, and I have a benefactor whose mother I looked after and he has given us a little bit of money.

DWM: Money.

NL: He won't be for the record, but he is the one who has founded the ISN/PKD prize.

DWM: Oh!

NL: Thomas Kaplan, who's a wonderful man, a young PhD in history who is really a very intelligent businessman but he supports all kinds of things, like the wild cats of the world. It's a lot of money to cats and I like him very much, so that's my one hope, that he will give us enough money to give this a try. The companies in general, don't like this because they feel that it'd fail. These things always fail. They always say that there are units rusting all away all over

Africa, and it's true because there is no maintenance, there are no spare parts, there is no player. That's why starting with acute PD is different.

DWM: PD, yes, yes.

NL: I just wanted to mention that to you as being something that I am very much interested in. My colleagues in my division, in my RRI, have founded a foundation to actually do this and we had our first event recently where there was a singer in Carnegie Hall, not the main hall but the smaller hall, and raised some money for it.

DWM: Raised money! Very good.

NL: So I think that's all. It's been a wonderful opportunity to talk so much.

DWM: I very much appreciate this opportunity to speak to you.

NL: You are very kind, and a very subtle interviewer.

DWM: Well it's my pleasure. I learn so much every time. It's amazing.

NL: What should be, I want to ask you, is I have this one thing about the RPA to still ask you.

DWM: Okay.

NL: It's not on the record.

DWM: Okay.

NL: Eli Friedman, before I get to that, did Eli have different views of some of the things I've said.

DWM: No, I would say that (dictation ends)

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