Donald P. Connelly, MD, Ph.D.
Narrator

Dominique A. Tobbell, Ph.D.
Interviewer

INSTITUTE FOR HEALTH INFORMATICS
HISTORY PROJECT

UNIVERSITY OF MINNESOTA

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In 2015, the Institute for Health Informatics (IHI) celebrates the 50th anniversary of health informatics at the University of Minnesota. Early institutional markers serve as the formal beginnings of the emergent discipline of health informatics at the University of Minnesota, designating the University of Minnesota as one of the first academic institutions to support and subsequently anchor the development of the new discipline. In 1965, the National Institute of Health (NIH) Division of Research Resources awarded the University of Minnesota's College of Medical Sciences a grant to establish a Biomedical Data Processing Unit at the University. Two years later, the Hill Family Foundation awarded a ten-year grant to Professor Eugene Ackerman to initiate a graduate research and training program in Biomedical Computing. In 1968, the College of Medical Sciences established the Division of Health Computer Sciences, which would serve as the administrative home for the NIH research resources grant, housed within the Department of Laboratory Medicine. The Division provided interdisciplinary training to pre-doctoral and post-doctoral students applying health computer sciences technology to health services research. In 1974, the University of Minnesota was awarded the prestigious National Library of Medicine Grant for Training in Health Computer Sciences, which formally established the Graduate Program in Health Informatics at the University of Minnesota. The Division and its institutional successor, the Institute for Health Informatics (created in 2006), received continuous training grants from the National Library of Medicine until 2009. For fifty years, the University of Minnesota has been one of the preeminent health informatics institutions in the United States.

The Institute for Health Informatics History Project captures, analyzes, and records the history of health informatics at the University of Minnesota. Through oral history interviews, the Project preserves the personal stories of faculty members and National Library of Medicine administrators who were involved in the early history of the field and have keen insights into the history of health informatics at the University of Minnesota.

Biographical Sketch

Donald Connelly received a BS in Electrical Engineering in 1964 and an MS in Electrical Engineering in 1965 from North Dakota State University. From 1965 to 1966, he worked as a digital design engineer at IBM in Rochester, Minnesota; in 1967 as an electrical engineer in the Section of Engineering at the Mayo Clinic in Rochester; and from 1967 to 1970 as a programmer in the Department of Physiology at the University of Minnesota. In 1971, he received a medical degree from the University of Minnesota. Between 1971 and 1972, Dr. Connelly completed an internship in internal medicine and between 1972 and 1974 a fellowship in Laboratory Medicine and Pathology at the University of Minnesota. Also from 1972 to 1974, Dr. Connelly was a Public Health Service Postdoctoral Fellow in Health Computer Sciences in the Department of Laboratory Medicine and Pathology. In 1974, he was appointed assistant professor in the Department of Laboratory Medicine and Pathology and director of the department's Laboratory Information Systems Division – a position he held until 1998. In 1977, Dr. Connelly received a Ph.D. in Biometry and Health Information Systems from the University of Minnesota. Between 1985 and 1997, Dr. Connelly served as the associate director of the National Library of Medicine Training Program in Medical Informatics. From 1999 to 2001, he worked at iMcKesson LLC, a subsidiary of McKesson HBOC, Inc. focused on delivering health care technology services; he held the position of director of Clinical Product Design. From 2001 to 2008, Dr. Connelly served as Director of the Division of Health Informatics (renamed the Institute for Health Informatics in 2006). He also served as the director of the Informatics Shared Resource from 2001 to 2007 and co-director of the Biostatistics and Informatics Shared Resource from 2007 to 2009 at the University's Masonic Cancer Center. He retired from the University in 2012. In 1986, Dr. Connelly was inducted into the American College of Medical Informatics.

Interview Abstract

Donald Connelly begins by discussing his educational background, including his early interest in biomedical computing. He describes his first years in the Department of Laboratory Medicine and Pathology including the state of computing in laboratories in the 1970s, the atmosphere of the Department, and his experiences as director of the Laboratory Data Division and acting director of the Outpatient Laboratory. Next, Dr. Connelly discusses his experiences as a Ph.D. student in the Division of Health Computer Sciences. He goes on to describe his early research developing ways to graphically display laboratory data to clinicians, and his subsequent research with Theodore Thompson, MD, to develop a clinical workstation for the University of Minnesota's Neonatal Intensive Care Unit. He also describes his work developing an automated decision support system for blood bank personnel assessing requests for platelets. Dr. Connelly next discusses the courses he taught in the Division of Health Computer Sciences; the National Library of Medicine Training Grant programs; and the interdisciplinarity and interprofessionalism of health informatics. He reflects upon the leadership of Eugene Ackerman and Laël Gatewood, the challenges each faced due to the lack of strong institutional support for the Division of Health Computer Sciences, and the

increased status of health informatics within the University following the establishment of the Clinical and Translational Science Institute. He also discusses his experiences directing the Division of Health Computer Sciences. Dr. Connelly briefly discusses the relationships between the Division of Health Computer Sciences and the Mayo Clinic, the Biomedical Library, and the Minnesota Department of Health. He next discusses work that he has done in the area of electronic health records. Dr. Connelly goes on to discuss the establishment of the Institute for Health Informatics; the directorship of Julie Jacko; and the establishment of the Master's in Health Informatics. Finally, Dr. Connelly reflects on some of the major changes he has in health informatics observed over his career.

Interview with Doctor Donald P. Connelly

Interviewed by Dominique Tobbell, Oral Historian

Interviewed for the Academic Health Center, University of Minnesota
Oral History Project

Interviewed in Doctor Tobbell's Office in Diehl Hall
University of Minnesota Campus, Saint Paul, Minnesota

Interviewed on August 12 and November 6, 2014

Donald Connelly   - DC
Dominique Tobbell   - DT

DT: This is Dominique Tobbell. I'm here with Doctor Don Connelly. It is August 12, 2014. We're in my office in Diehl Hall.

To get us started, perhaps, you could tell me about your educational background.

DC: I completed a Bachelor of Science degree in electrical engineering at North Dakota State University in Fargo and, then, went on the next year and got a master's. I was kind of the first biomedical engineering graduate student in the electrical engineering program there.

I worked with an ear, nose, and throat doctor who put cold water into people's ears to make them dizzy and, then, recorded the nystagmus movement of their eyes as this cold water stimulated their inner ear. That kind of stimulated my interest in computing in medicine. At North Dakota State, we had hands-on access to computers. We would take these stacks of punched cards, about thirty-six inches of compiler code and thirty-six inches of operating system, and load it into a computer with our thirty-card program. All this stuff would go through, and you could actually compile your program and run it. My advisor and I had designed my master's program there to get me ready for a job in computing in medicine.

IBM [International Business Machines] had a big group down at the Mayo Clinic in Rochester [Minnesota], at that time, and they had signed me up a year in advance, before my master's degree, to come on down there and work in their computing in medicine group. But just shortly before I got my master's degree, IBM and Mayo Clinic had a falling out, so the three large departments of IBM folks at Mayo were, more or less, deleted from the Mayo property. So when I got down there, there was no longer a

computing in medicine opportunity to get into at Mayo. But I worked at IBM and did some interesting things in terms of counting up to twenty-five in less than twenty nanoseconds as part of an optical readers of Social Security forms. But it wasn't quite what I wanted to do.

I decided to apply to medical school here at the University [of Minnesota]. I applied, and I was quite surprised that I actually got accepted, but it was provisional, because I had a lot of biology courses I had not taken in my engineering program. So I went down the road and worked in the Section of Engineering at the Mayo Clinic for about two years. They let me work part time there so I could make up my biology and chemistry prerequisites at the junior college. Then, I came to Minnesota. I tell people I was institutionalized at the University of Minnesota in 1967. I never really got out of there. Well, I suppose retirement is pretty close to getting out of there, but here I'm back today.

DT: [laughter]

DC: I did my medical training here and was lucky enough to get an internship. In those days, they had true internships in internal medicine. Then, I enrolled in the laboratory medicine program here. This was one of the top programs in the country and one of the first ones in laboratory medicine of its kind. Not quite at the same time, I enrolled in the Health Computer Science program. I got my boards in laboratory medicine, and I got my Ph.D. in Health Computer Science. Actually, in those days, it was Biometry and Health Information Systems.

Then, I actually went to work. I think I was thirty-seven at the time when I finally got done with being formally enrolled more in class than in working.

Is that far enough for educational background?

DT: Yes, sure.

I have your CV [curriculum vitae] on the reports from the NLM [National Library of Medicine] annual reports, and I saw that you were a post-doctoral fellow in health computer sciences from 1972 to 1974. So I took that to be that you must have had public health service funding of NIH [National Institutes of Health] funding.

DC: Yes. We did have public health funding. I can't remember the program at this time.

DT: It looked like it was Research Resource-267.

DC: Yes, that sounds right. In those days, I didn't understand what all of this was, because I was from a small town in Minnesota and the first of my family to go to college. I didn't even know what an assistant professor was let alone how to be one.

DT: [chuckles]

When you were at North Dakota State, how was it that you decided to focus on biomedical engineering?

DC: It kind of evolved. It seemed to be that one of the tipping points was one night I was studying dutifully at the library at North Dakota State University. I often did a lot of browsing at the library, much as I used to do here when browsing made sense, because you had to have physical access. I found this book about measuring the electromotive force of the heart and looking at the waveform. I saw what an EKG [electrocardiogram] waveform looked like, and I read a couple of chapters. It just seemed to be so interesting that that kind of got me interested in the biological aspect of computing, and measurements, and such. Deciding to apply for medical school took a little longer to develop, because it wasn't something I had ever thought of before.

DT: How would you describe the culture in the Department of Lab Medicine as you transitioned maybe from being a resident to being assistant professor?

DC: When I was a resident, computing in laboratories was not very advanced. So, basically, every lab rotation I went to, I would often leave a little computer program which they ended up using for, in the one case, a decade. This was in the Microbiology Laboratory when I was in there. They had a mandated requirement to annually report the pattern of antibiotic sensitivity of all organisms cultured in all patients. This was a real big hassle for them because it involved a lot of data. So I wrote a program that they used to key punch in the results of each sensitivity report, and then compile them all. In those days, they probably had a couple thousand of those a year. They would key them in, load them in with my program, and out would come a consolidated report that the 23% of the e coli organisms were sensitive to Antibiotic A but 87% were sensitive to Antibiotic B. I remember putting an edit check in the date field to catch keying errors. In each culture, you had to enter the date of that culture. I put in an edit check—this, I think, I wrote in 1973 or so—"Don't allow anything beyond 1989." I got a call on January 2 or 3 of 1990, "Your program doesn't work any more." First of all, I was surprised they were still using it almost twenty years later. Also, it was pleasing that it was easy enough to fix. I changed the edit check in the FORTRAN program so it would allow up to the year 2000. By 2000, there were commercial solutions that were much better so I didn't get calls to fix at that time.

The culture in Laboratory Medicine and Pathology was very conducive to doing strange things. In that day, computing in medicine was probably considered by most as kind of a strange thing.

Doctor Ellis [S.] Benson was the chair. My elders told me, "Do what you're interested in and Doctor Benson will call it laboratory medicine," because laboratory medicine had a pretty broad front of what it could be. Again, it was largely formed at the University of Minnesota along with a number of other key institutions here and in Europe. Doctor Benson had a special interest in data presentation and clinical decision-making, so I kind of became his natural understudy. He had me participating with him in many

conferences, especially in Europe. That's where a lot of this was going on, in the UK [United Kingdom] and Sweden. So I would often travel with him. Of course, I always had to give a presentation or two. That effort in Europe, and internationally, was something that he was really, really well known for. Eventually, he asked me to co-edit with him a book [*Clinical Decisions and Laboratory Use*] that was published by the University of Minnesota Press. It was kind of a heady time for me, because we were really doing new and interesting things. Just about everything you did was publish-worthy, because not many people were doing it yet.

DT: I saw that you were director of the Laboratory Data Division and acting director of the Outpatient Lab.

DC: Yes. The Laboratory Data Division, I think, was the key reason I was hired. Even when I was in my residency, they knew that I knew more about programming than, perhaps, anybody else in the clinical lab. I think Doctor [Eugene] Ackerman saw me as kind of the protégé to be able to manage that laboratory computer information system when we finally got it installed. The department had had a couple of efforts of self-developing information systems for the laboratory. The clinical laboratories were one of the first bastions of computing in healthcare, really. They had tried to develop two systems locally. It always turned out to be a lot bigger project than they thought it would be and, for various reasons, they were not real successful. I remember Doctor Ackerman was very influential in selecting the next lab information system, because he had, by then, become the go-to person for information systems. He decided very early on that we should go for a commercial system, a system that had been developed for other important laboratories, big laboratories similar to ours. So that's what we did and we did get a system.

I remember it well. It was the Medlab System that had been developed by a firm in Salt Lake City [Utah]. The reason I remember it so well is the key manager in the Lab Data Division, Phil Saint Louis and I basically, lived with that computer for the first three months, because the mean time between failures was about twenty minutes.

DT: [chuckles]

DC: As it turned out, there was some flaking of paint in one of the big digital data drums that would frequently crash the heads. Now, things in those days were not quite as precise as these days. Even when one of the heads crashed, it didn't really destroy data. It just caused the system to fail, and we'd have to go in and re-boot it. Like I say, it was every twenty minutes for the first three months until they found out the root cause. It just about killed us. I guess what doesn't really makes you stronger, so we were really, really strong at the end of that time. Eventually, that system became quite stable. Although we figured with technology moving so fact, you wouldn't keep a system for more than five years, well, that system stayed in for I can't remember whether it was thirteen years or seventeen years. As it turns out, a lab information system is such an integral part of the laboratory that even if people hate the system, changing to a new system is considered even worse than that. Your old lab system isn't so loved as it is when you announce,

"We're going to change this out and get a different one." We went through, a couple more changes of systems every fifteen years or so. But things got a lot better after the first four or five years. It became possible that you could actually run a real time system and run it reliably. But it just about killed us.

DT: [laughter]

I should have asked you about your experiences as a Ph.D. student in Biometry and Health Information Systems.

DC: That goes back a long time. It's always a challenge picking a dissertation topic that's properly scaled to the time one has. I was watching Professors [Laël C.] Gatewood and Ackerman. Their research, at that time, was modeling glucose metabolism. It involved the simulation of glucose, how it gets from the blood to the cells and so on and so forth. This idea of simulating real life caught my attention. I was doing that about the same time I was doing my residency.

The lab had sent me out to the East Coast where we picked up one of the new, at that time, Coulter counter systems, which was considered really leading edge. We were studying one of the first white cell count differential machines out there near New York City. The lab was having a problem getting the work volume handled with what they had, so they were importing this new machine. I got interested in simulating what this new machine could do in terms of work volume. Then, I built, basically, a computer-based simulation of a clinical laboratory. You could put as many of these machines in the clinical lab as you wanted to and you could staff them with techs through the hours of 3:00p.m. to 11:00p.m. or whatever you wanted. We could see work volume either stack up or get handled and, then, the same with the blood drawing. They would start coming in at five o'clock in the morning on Monday through Thursday, but not so much on Friday, Saturday, Sunday.

We built a complex simulation system and that was my thesis. As often happens, when you do a dissertation, I kind of got, I don't want to say tired of it, but simulation requires so much guess work, guessing parameters of the system. So much of what the system is telling us is based on guesses that I just thought, that's not quite as down to reality as I was comfortable with, so I didn't do too much about simulation after that.

DT: What was your research that you moved into then?

DC: I was always interested in working on systems that were clinically friendly, especially to clinicians, the doctors and nurses. One of the first things we worked on was data presentation; that is we in the lab, even back then, were really generating tons and tons of data. People ordered tests like crazy. When I was an internal medicine intern, I ordered tests like crazy, too.

[chuckles]

DC: We were working on ways of presenting this data so that they might be more easy to use or hidden signs would become easier to see, so graphical display of laboratory data was one of our first things. We used Control Data's [Control Data Corporation] PLATO [Programmed Logic for Automatic Teaching Operations]. PLATO became one of the first microcomputer-based systems. PLATO was developed really for training and education purposes. It had a touch screen and you could do wonderful things with it. So we adapted that. We would present a roster of patients on a particular clinic. You could touch the patient's name and, then, touch the tests, like maybe I want to see all the electrolytes for that patient since they've been in the hospital. Then, we'd present those graphically. We had a few anecdotes. Some of the physicians using this actually said, "Oh, yes, it did reveal a value we had missed." So we had anecdotes but we didn't really, in those early days, collect data that would show that this was actually improving patient care. We had pretty good use, so we figured it wasn't disservicing patient care. We kind of worked on the area of making it more and more user friendly and usable. Of course, we published lots of papers on graphical display of laboratory results and looked at lots of different ways of displaying them. That led to many invitations to give talks. Back then, it was easy to talk about graphical displays, because it was so pictorial. You could talk all day about different ways of presenting data. Like I say, it was in the early days so you didn't necessarily have to have data showing that this made any difference other than it was being used.

By then, there were true microcomputers being developed. I remember the Hewlett Packard touch screen was, to us, a tremendous breakthrough. It was more commercially available than the PLATO system was. It was made for front-end use. We talked with [Theodore R.] Ted Thompson—he passed a few years ago [Doctor Thompson died on July 28, 2013]—he was the director of the Neonatal Intensive Care Unit where there's tremendous amounts of data flowing. I asked him, "What would be the best thing we could do for you in the Neonatal Intensive Care Unit in terms of getting lab results back?" That ended up with a touch screen with graphical display that was used intensely. It was right in the Neonatal Intensive Care Unit. It gave up the ghost after thirteen years, because the air ventilation slots got totally plugged. Well, they didn't vacuum. We weren't really too good on information technology maintenance in those days. First of all, most of the information technology wasn't that crucial on a day-to-day basis. But it lasted for thirteen years. The docs, when we polled them, were very favorable towards it.

From that we went on to a funded study by the National Heart, Lung, and Blood [Institute]. We were interested in proving the use of platelet transfusions. At our Hospital, we had a very active bone marrow transplant program. We were one of the biggest users of platelets in the nation. The director of blood banks was interested in not necessarily curtailing platelet use, but making more effective use of platelets we had, because it they were a vital but finite resource. There were some clinical—they didn't call them guidelines in those days but they were—guidelines for appropriate platelet use. So we built some of those into a workstation, so the docs would order platelets up on the ward. The station would look at the past results and would see the current platelet count. If it wasn't low enough to justify platelets by the usual rules, it would ask why do we use this. It was very courteous, of course.

DT: [chuckles]

DC: It was kind of one of the forerunners of the modern electronic health record, which can now challenge docs every step of the way, which they really, really hate. We had some good early on experience doing that back in the early 1990s.

One of my programmers had heard about browsers. I think I had heard about them but I didn't know exactly what they were. One afternoon he had me come over to his workstation and he said, "Do you see that patient's name right there? Why don't you touch it?" I touched it and up came a list of tests, not the results but the tests. I touched potassium and a few seconds later, the patient's actual potassium was right there displayed in front me. So, all of a sudden, we saw a browser, this touch sensitive screen, and we thought, oh, my gosh, this is the answer for clinicians. You just point at what you want. This was a real breakthrough in clinician-friendly computer systems.

DT: [chuckles]

DC: It was really an exciting time. We, more or less, redeveloped the data display portion of our expert system project. We developed that using Mosaic browser technology. I think what would have taken us four years with the old technology to do in terms of functionality took less than six months or so in the new html [HyperText Markup Language] technology. Again, we thought this is the answer that we've been searching for all of our lives. This is going to change medicine forever. Well, it probably will change medicine forever but not quite as fast as we had anticipated.

At that time, Jim Bradley, a local information technology business guru who had been really well known in some of the work he led at United Healthcare.

After his experience at many successful projects, he was interested in starting his own company. He came over one afternoon and saw this browser technology we had developed. Within a few months, he invited a group of us out there for some commercial effort, so I took a part time leave. Others took a full time leave and some of them are still working in companies that evolved from this work. To industrialize this, it took us a good year and a half to get that ready for market. Actually Allina Healthcare was one of the first groups that had the courage to take a chance with a small company using very current technologies. It was kind of an exciting time to see what people did out in the real business world. At the same time, I realized there were a lot of wonderful people out there that could be just as dedicated as any of us threadbare academic types at the University.

DT: [chuckles]

DC: It was a great learning time.

I, eventually, came back fulltime to the University, and we got involved in a funded study by the AHRQ, Agency for Healthcare and Research Quality, one of the two federal agencies that fund health information technology studies. There, we were trying to show the effect of electronic health records on patient care where we studied use in the emergency room. Although, we had very, very complex models, we did see some effect. It was kind of a small effect. It was kind of an early study on the effects of electronic health records. That was last big study that I was involved in. Is that enough?

DT: Yes, that's great. That's excellent.

What was the name of the browser?

DC: It was Mosaic.

DT: Oh, it was Mosaic. I have that written down. Okay.

DC: That was the first of the free browsers.

DT: At the same time that you were doing all of this research, you were teaching in the Health Information Systems program, as well?

DC: Right. I was doing graduate level courses. I, also, had some graduate students. I became, first of all, an assistant professor and, eventually, moved up the ranks to professor.

DT: What types of graduate courses were you teaching?

DC: The one that I persisted through the longest probably was a course called—I don't remember its number—Clinical Decision Making Techniques, so we studied various quantitative methods for making clinical decisions. The one that was best scaled to teaching was Decision Analysis, but we, also, covered expert system technology for making decisions and Bayesian statistics. We looked at some of the eventual techniques that kind of simulated brain cells. I think I taught that for almost fifteen years or so.

DT: I wonder if you could talk about the NLM training grant in Health Computer Sciences, the first of the training grants that Health Computer Sciences had.

DC: The first training grants were done with Doctor Ackerman and Doctor Gatewood. They did almost all of the work on the early ones. Subsequently, Professor Gatewood had the lion's share of that. These things always were done with a deadline, and I know she was working every minute up to that deadline. I was always amazed that the final product really looked good and was really extensive. I usually learned quite a bit from each grant application. I didn't realize all that stuff was going on in our campus.

DT: [chuckles]

DC: Laël had done a tremendous job at working throughout the campus. She could make those connections. The training grants made the University of Minnesota look to be a very fertile place for this type of work, and it was a very fertile place. Actually, money got a little tight so it became a little less fertile, but certainly in the early days, it was a very good place to do this work.

DT: The second type of training grant was the research training in medical informatics. The result of that was the development of research clusters. I saw that you were director of at least a couple of the research clusters. Could you talk about that?

DC: That was a training grant but it evolved into, I think, in most cases, four and sometimes five research clusters. Computing in medicine, you could make computers do just about anything, so it could be a very wide, broad area. You could do almost anything, but that's not necessarily the best way of developing a strong program. It's better to get some on focus, so that's what these clusters would attempt to do and bring people of similar interests together. We see that over in the Cancer Center. It's very similar to that, the funded Cancer Center programs where they have core programs that bring birds of a feather together, not necessarily that they all do the same work but it often does lead to more synergy because multiple people are not necessarily focused on the same idea but at least working in the same general area. That can bring strength in terms of research publications and impact.

DT: It seems like, based on the students, that the Health Computer Sciences was getting…and, then, just looking at the different backgrounds of the faculty, that Health Computer Science was very interdisciplinary and interprofessional, too.

DC: Yes. That was, perhaps, a frustration at times. Health Computer Sciences always has been very interdisciplinary and also very interprofessional, as you say. As long as I can remember, the presidents of the University's annual message would always say how important it is to be interdisciplinary. I don't think they worried too much about the interprofessionalism. Departments are very, very strong, especially in the Medical School. Let's say there was more verbal commitment to that, than there was emotional or effortful commitment. That was kind of a source of frustration at the time, but, at the same time, that's kind of evolved now. Today there are more departments that do have an appreciation for the import of informatics in their areas of expertise. So there have been a number of younger professors that are in very strong clinical departments that are blessed with leadership that sees the importance of informatics, of facilitating them bringing informatics to that clinical field.

DT: Obviously, you've worked—you mentioned Ted Thompson—with different departments and Lab Medicine being an obvious one. That's your home department. Have you worked with any of the other professional schools?

DC: Oh, I see what your saying. Oh, yes. I worked with a couple of docs from Internal Medicine and a business professor over on the West Bank. What we were studying was when physicians are taking care of patients, if they recognize a gap in their knowledge

about a specific case, how do they go about filling that gap or do they attempt to or whatever? That led to a number of very interesting collaborative events, like I say, with Internal Medicine and with Family Medicine and [Information and] Decision Sciences [Department] in the Carlson School. We also worked over the years with a number of the professors in IT [Information Technology], as well, in computer engineering and such. There was relatively a lot of collaborative…not only cross-departmental but cross-school efforts going on. I think it's a fairly healthy environment for that as long as you get people that have a true interest and share a common interest and that have great diverse strengths to cling to so that something new can come out of all of that.

DT: One of the limitations that you already kind of hinted at was that as much as interdisciplinarity is often kind of held up as this ideal, it's more lip service, at least historically, than there being real institutional support for it. It seems, based on the reading I've done in the archival documents, that the Division of Health Computer Sciences often struggled for a sustained institutional financial support. Was that your sense of things?

DC: Yes.

DT: It seemed like, in particular, that getting new tenure lines was particularly problematic.

DC: Right, right. If a tenured professor left, the position disappeared.

DT: Were you involved at all in the National Micro Population Simulation Resource?

DC: No. That was always Laël and Doctor Ackerman's thing. Their forerunner to that prompted my interest in my Ph.D. work that I was doing in simulation.

DT: It's amazing how they managed to do everything…

DC: Yes, it really is amazing.

DT: …and, actually, how any of you managed to do anything given how productive you all were in addition to all the teaching.

Could you reflect on Gene Ackerman's tenure as director of the division?

DC: Uhhh… I'm not exactly sure what you mean.

DT: What was his leadership…?

DC: I'd like to go back further than that when I was a student. I remember willingly working really, really hard on his graduate school assignments, not that he made them so hard and effortful. Maybe it was my group of co-graduate students. He would give this assignment, and we would take it to tremendous lengths, just study it deeply. I'd have to

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say he really motivated us to study deeply. We weren't studying to make him feel better; we were studying because we really enjoyed what we were doing and what we were investigating. So I remember him as a professor that really could impart the material but he could also get you interested in a deep way in the material.

The rest of Laboratory Medicine and Pathology was led by, if not physicians, then by Ph.D.s that had a classical bioscience type of background in chemistry or something of that nature. I was at a different level below, but I think I could sense his frustration at times of not being quite in the club, if you will, of departmental players, our players. But I think that was because informatics was different than everything else. I think he did everything he could to be an effective resource gatherer in that situation. At that time, I wasn't playing a very…I wasn't into power politics, so I'm not sure what was going on.

DT: Then, Laël replaced him as director. Did she have a different leadership style? I wonder if you could reflect on her time as director.

DC: Laël had a different leadership style but the thing that marks her is she's indefatigable—I'm just amazed—especially if there's a deadline. She could take stuff and turn it from a bunch of tatters and smatters here and there and turn it into something that really looked strong and as if it were planned out. [chuckles] Part of my problem is I haven't had much… Like I say, I was institutionalized here, and I never left. Neither Laël nor Doctor Ackerman was very directive, if you will. They didn't say, "Okay, here's the plan. This is what we're going to do." Well, of course, with the training grant, you did have structure there. If you were asked to take one of the positions, you were expected to follow through with what was there. That was fine. Neither one of them was going to be bossing you around. Of course, as academicians, I guess nobody does that or can do that effectively.

DT: [chuckles]

DC: I think they did the best anybody could do within the many constraints that we and they were within.

DT: Then, you took over as director and you served as director is it from 2000 to 2007?

DC: Yes. Maybe that's where I got a better appreciation of what Laël and Doctor Ackerman had been working through. The constraints got tighter. Well, yes, so probably at that point, I better appreciated what they had been going through. It was a tough time. Had I to do it over again, I don't think I would.

[chuckles]

DT: Are you comfortable elaborating on what some of those challenges were?

DC: There wasn't a big slab of money with which you could do anything. There was absolutely no capability of building something. I liken us to be kept just on the survival side of anoxia.

DT: [chuckles]

DC: So, yes, it was a tough time. Early in that stage, people still didn't really, really understand what the importance of informatics was. What really established informatics' importance in this institution was, finally, when NIH came out with its Clinical and Translational Science Award program which underlined informatics as one of the six pillars of a successful program.

DT: Of the CTSI [Clinical Translational Science Institute]?

DC: Yes, the CTSI became the University's response to NIH's stated need for a strong informatics base. No matter what any of us local informatics people would say had the influence of what the NIH director said. When they actually evaluated those grant applications, the importance with which they graded informatics caused a sea change. It caused a lot of informatics expertise to get developed and, also, it gave informatics a chance to prove itself in terms of its importance in the medical and clinical research spheres.

DT: When did the Division of Health Computer Sciences get renamed as the Division of Health Informatics?

DC: [pause] Oh, gee. Maybe you can look that one up.

DT: Yes. I've been trying to figure it out. I'm going to ask Laël.

DC: That's the key person. She will answer that real easily.

DT: Okay. [chuckles] I wasn't sure if it was during your tenure. I'll ask Laël.

DC: I suppose it came once the CTSI program became something that the institution realized it really [unclear] and they adopted that renaming.

DT: I'm going to be asking Connie [W. Delaney] about that, too.

DC: Yes.

DT: Could you comment on, if you wouldn't mind, the longstanding relationship between the Division and Mayo.

DC: [sigh] That's really a Laël question. She was the one that was so intricately tied. Of course, they came from Mayo. Of course, I came from Mayo, too, but not through the academic route.

DT: [chuckles]

DC: I had a two-year stint. When Health and Computer Sciences formed here, there were already strong ties with the Mayo Clinic. I don't know when Doctor Ackerman might have formalized those ties with Mayo, and I don't know if Mayo was part of the original training program or not. I thought it got tied in later, but I don't know. That was not my area of historical genius.

DT: Do you recall when Biometry and Health Information Sciences split in the mid 1980s and, then, the Ph.D. in health informatics became established?

DC: Yes, I do remember the partitioning. [pause] The partitioning was probably caused more by people than it was by disciplinary boundaries. As you know, the University's boundaries can be very, very flexible and stretchy, the boundaries of field boundaries. It was just determined, at that time, it would be better to have them separate fields than having them joint. Maybe it was as simple as, well, everybody else had them separate so why are we trying to preserve something that is an historic artifact? But we didn't vote on that, as far as I remember.

DT: We're at 2:40, and I wonder if this might be a good stopping point.

DC: Sure.

DT: I have a few more questions. Maybe we can schedule another time?

DC: Yes, that would be fine.

DT: Okay.

[break in the interview]

DT: This is Dominique Tobbell. I'm here with Don Connelly. It's November 6, 2014. We're in my office in Diehl Hall.

Thanks for meeting with me again.

DC: It's good to be back.

DT: We covered a lot of ground the last time. I just have a few more questions. One of the things we didn't cover… In the history of health informatics here, the Biomedical Library has played an important role. I think there's been a long relationship with the Division of Health Computer Sciences. I wonder if you could speak to the role of the Biomedical Library.

DC: [pause] Well, perhaps because the funding source of the Health Computer training grant was always administered by the National Library of Medicine… There was always the request for proposal document from the National Library of Medicine… I hadn't thought about this. There was always an affinity between the library at the national level and informatics. As long as I can remember, there was always an affinity between the Biomedical Library and Health Computer Science. Every time, Doctors Ackerman and Gatewood, in those early days, applied for the training grant, it always really established a fairly rich tie between the Biomedical Library and the training program. I think, subsequently, in later years, the tie with the director of the Biomedical Library got really richer so that there was space made available in Diehl Hall and a real subsequent collaborativeness, if you will, between the Biomedical Library leadership and staff and the Health Computer Science program. [pause] I think, certainly, Laël would have much deeper details about that. She was living much closer, especially in the early days, with the Biomedical Library. As far as I remember, there has always been a long collaborativeness between the Biomedical Library and the Health Computer Science program.

DT: That's definitely come through in the archival materials I've read and in the other interviews, too, and now that the IHI [Institute for Health Informatics] is situated in the library.

DC: Right.

DT: Did you have any involvement with the projects that the division did with the Minnesota Department of Health?

DC: [pause] I guess most recently one that the Minnesota Department of Health… Well, this is more recent than maybe you're thinking about. If so, you'll have to correct me.

DT: That's okay.

DC: I think it was in 2004 when the President of the United States for the first time said the electronic medical record [EMR] was important. I think a year later or so, the Minnesota Department of Health, under [Martin] Marty LaVenture, established a set of working committees and groups to meet some of the goals that had been federally determined, if you will. I can't remember what these were right now. I got involved in serving on a number of those committees and on the board for a while. That got going; it really got geared up by about 2005, 2006. It's been going pretty strong since then making really the State of Minnesota pretty much in the forefront of the electronic medical record in the direction the federal folks kind of set. The Minnesota Department of Health got a lot of education going: needs identification, the SWOT [Strengths, Weaknesses, Opportunities, Threats] analysis across the whole state. The program was consistently a part of that. That certainly continued after I retired, as well. There were usually a few of our faculty involved in those committees.

Your original question was about the Department of Health, right?

DT: Yes.

DC: Things before that are just a cloud in my memory. Could you kind of prompt me?

DT: I just know that there were several collaborative efforts. I think there was a cancer registry project.

DC: Oh, yes.

DT: I think Laël was involved in that.

DC: Yes.

DT: I just know that the Department of Health is one of those longstanding collaborative ventures that the division was involved in.

DC: Yes. Public health informatics was an area that was especially of interest to Laël. She's been involved in that a long time. I can't remember whether there was an important meeting kind of defining public health informatics. I think that was in the early years of this millennium. Then, one of our graduate students, Marty LaVenture, was working on his Ph.D. in our program. He was working on it for a long, long, long time. He also got a job over at the Minnesota Department of Health, and he got more and more involved in the informatics components and other activities of that. I think Marty would admit that he kind of lengthened his Ph.D. obtainment because he was really, really busy. He was applying while he was learning. With Marty over there, that's been a very strong, rich tie to Department of Health.

You mentioned the registry. Often our faculty would ask some of our favorite collaborators, "Do you have a short-term project that we could get a team of our students involved in?" The Department of Health was always a rich one coming up with nicely scaled projects that students could accomplish in the quarter that they were working on at that time. These often led into longer-term one-student projects that took the initial idea to a more advanced state. Yes, I think it's certainly true that the Minnesota Department of Health has been a long time collaborator. Also, like Marty was often the adjunct faculty. They'd often be here giving a one-hour lecture introducing what public health informatics was all about and this type of thing. As far as I know, that collaboration is ongoing and, perhaps, stronger now than ever—although, Marty is probably so busy, I'm not sure. [chuckles] They certainly have been a strong collaborator over the years.

DT: Going back to the electronic medical record… I'm curious. I've been reading more generally in health informatics, and I know electronic medical records have been a kind of big project within medical informatics. I can't remember the content of it, but I do remember seeing that you had published some articles on electronic medical records. I'm

wondering how much work was happening here in the area of electronic medical records beyond what you've already mentioned.

DC: Well, here, by the early 1990s, certainly the University hospitals and such had professional CIOs, chief information officers. They, fairly early on, became committed to commercial systems. There really wasn't a lot of room for development.

I got involved in a couple projects. By today's standards, they wouldn't be called electronic medical records; they would be called reporting laboratory results. The Neonatal Intensive Care Unit was one of those with Doctor [Theodore R.] Ted Thompson. Dana [E.] Johnson was there, too. The Neonatal Care Unit is just inundated with an intense flurry of laboratory data. The lab results are very pivotal to the kid's ongoing care. The care is very tightly attuned and very responsive and interactive with what's going on right now in that baby's physiology. To me, who was in the laboratory, getting back that information in a more useable way and more rapid way was an important goal.

We put one of the first touch screens into the Neonatal Intensive Care Unit, so you could go up there and touch your baby's name and out would blast the last twenty-four hours' worth of results. You'd touch something else and you'd get graphical displays of the potassium and all that kind of stuff. That actually sat there for thirteen years before the unit itself gave up the ghost, because people forgot to vacuum out the back end of the Hewlett Packard microcomputer. That was one of the first uses of touch screen technologies in healthcare. It worked very well for that very focused, narrow part of the Hospital. I think we started that in 1984 or something like that.

In subsequent years, because of the CIOs that kind of ran everything, there wasn't a lot of room for research of electronic medical records here, not like at [University of] Utah and at [Brigham] Women and Children's Hospital where they got into medical records well before the commercial folks got involved. So they got a very strong footprint and contributed a lot to the early years of electronic medical records, and what they look like, and what they are today. Our University wasn't that heavily involved in the development of electronic medical records. I think our Hospital got them fairly early but it was really an operationally oriented thing as opposed to an academically oriented effort.

DT: Oh, I'm glad you explained that. It makes sense. In some of the publications I've been reading talked about Brigham Women and Children's publishing about the medical records much earlier. So that helps explain that.

DC: Yes. Like Homer [R.] Warner at the University of Utah was kind of the grandfather of all of those efforts and, then, [Clement J.] Clem McDonald who was at the Regenstrief Institute at the University of Indiana and now at NLM. Then, there were a couple groups out in Boston. They got into it and got a line of funding early on, so they could continue exploring and developing. We never quite had that opportunity here.

DT: I'm glad you've explained that now. That's good.

Changing track a bit… The Institute for Health Informatics was established in 2006. I wonder if you could talk about how that came about and kind of how that may have changed things.

DC: The Institute of Health Informatics was really established as kind of a response to sudden external recognition that informatics was important. NIH started their CTSA (Clinical and Translational Science Award) program and informatics was one of the seven or eight pillars of a translational science effort. Whereas those of us who had been inside informatics here for a long time, tried to promulgate the importance of it, it wasn't until NIH application directives clearly spelled out the importance of informatics.. The originally funded CTSA programs all had a certain kind of organizational structure for linking informatics into translational research. The Institute…I don't want to say it was a local attempt to imitate this successful program, but it was a response that recognized that a more formalized informatics organization and governance structure that provided a broader and deeper base than really had existed over the years. The Institute was the University of Minnesota's response to the national recognition that informatics was important in translational science.

DT: Did it change things in practice for the faculty?

DC: Certainly, for me and others, all of a sudden, we were on committees that were meeting for many more hours than before, and we were participating in grant writing that had a very collaborative multidisciplinary form. As far as the teaching effort, it didn't really change that too much, at least initially. I think it did get a number of the faculty much more deeply involved in the multidisciplinary clinical translational science efforts that were going on here.

DT: You stepped down as director in 2007?

DC: I can't remember. That's what it says?

DT: Yes, I think I have that right. Then, Julie Jacko replaced you. I wonder if you'd be willing to talk about her tenure as director.

DC: [pause] I'm not sure I want to go on record if these are going to be in the… Julie always dealt with me amiably and, as far as I was concerned, with the appropriate amount of respect for somebody who was so much older.

[chuckles]

DC: She probably lacked some of the experience she needed to really take on that job, but it was also a very dynamic state. She was always afflicted with most of the limitations that anybody in that position had, which included, perhaps number one, the lack of substantive funding that was going to stay there for very long. So I suppose she did probably about as well as possible. She was afflicted by some of their activities

maintaining ties back at [University of] Georgia at the same time. I don't know her role in that. But it just made it more difficult than it would have otherwise, probably.

DT: Going backwards again… I don't think we talked about this last time. The establishment of the master's [degree] in health informatics, I think happened in 2005. I wonder if you recall the process in which the decision was to establish that one-year terminal master's degree.

DC: Oh, we had been doing the master's far earlier than that. I wasn't really too involved in that. I think that might have gone back to when President [George W.] Bush called for electronic medical records to be throughout the nation in ten years. One of the efforts was to increase the number of people trained in informatics with a focus on implementing electronic medical records. The effort was, well, we need these people out in practice rather than up in the lab researching things, so the terminal master's came out of that. There was funding. Out of that evolved this multi-institutional collaboration where the terminal master's was one of contributions. I think each one of the collaborating schools had to do… I'm talking about Saint Scholastica and the University of Minnesota, and I don't remember…

DT: Was it Normandale [Community College]?

DC: Yes. That was really an effort to get practitioners out and get them out fairly quickly, because the idea was if we're going to have medical records though every hospital within ten years, we better get these people out so they can contribute. Again, there, if you want more detailed information, Stuart [M.] Speedie would be more up to date. He was much more deeply integrated into that. Of course, Julie Jacko, too. If she wasn't the PI [principal investigator]; she was the co-PI of that effort, I think.

DT: When you stepped down as director, you returned to the faculty. Did you return to your research projects?

DC: Yes. I was finishing up a project funded by the AHRQ. That's kind of how I started my retirement program was with that funding. I was kind of paring down what percentage of my effort was funded by that project. So we stayed in that. We did get a one-year extension because we hadn't spent all the money yet. We were able to get a final report in on that.

DT: What was that project?

DC: We got that funded in 2003. The Twin Cities was kind of unique because three of our four large health systems all started using Epic electronic medical records. Epic Systems Corporation is a company in Madison, Wisconsin. If you know anything about electronic medical records, they're the number one vendor, if you will, especially in the large and academic healthcare marketplace for electronic medical records. The University Hospital brought them in for part of their electronic medical records, actually later than Allina and HealthPartners over at Saint Paul Regions Hospital. So we had

these three large health systems that were all using Epic in one way or another. So we wrote a proposal saying that we're in a unique position to demonstrate the value of system interoperability, the assumption being that since all three hospitals were using Epic, it would be feasible to exchange medical records between the systems as the patients transitioned between systems. This was in 2003. Standards for such interoperational work weren't yet established but by end of 2003, the standards had at least been identified by the Office of the National Coordinator [for Health Information Technology] for electronic medical health records. We thought, oh, this is it. Certainly, Epic will adopt these standards and, in short order, we'll be exchanging information amongst these hospitals. Well, it didn't go that quickly. Maybe five years after our grant was finished, they actually started exchanging information among Epic systems. Epic kind of lagged in terms of developing operability with other systems. They basically owned the marketplace anyway, so why should they make competing systems more effective? That's been kind of a political football up until the present time and, now, there is thought that, finally, Epic is going to have to give on that and commit to true interoperability, just like some of the other competitors. We did do some demonstrations testing to see if hospitals with EMRs behaved differently than those that didn't. The results weren't really very compelling. We think they would have been much more compelling if we would have actually had interoperability established. You can't push society. We thought society would naturally flow in that direction once it became standardized. The premise was very logical and compelling but, even today, it's only now being accomplished.

DT: Would you be able to reflect on what you think are some of the major changes in health informatics that you've seen over your career, both at the University and in the field more generally?

DC: [pause] It's certainly become more identified, not necessarily better defined what health informatics actually is. The general field of it is much better known. There may be a fuzzy understanding of what it is or maybe just a very diverse understanding of what it is. There are programs. The number of programs are much greater. I think maybe one of the disappointments to me is that they're probably no better funded than they were in the past. It's probably one of the problems of an inherently interdisciplinary undertaking. They don't get rich funding. In a way, also, it's not like the rest of biomedical science where it's us against nature rather than us against an engineering problem. I don't mean to say us against nature, but one where discovery… How does Alzheimer's disease actually come about? If you could figure out what that is and, of course, come up with a medication to deal with it, that's much more of a conventional and accepted focus of research than informatics is or has been. But I think it's more widely understood by medical school leaders, that there is an importance to informatics, which they might not quite understand, but they no longer have to be convinced that it's important and that they need to have something going.

I guess the other thing that I noticed is that a lot more of the old timers are disappearing from the scene as we experienced this last weekend with Doctor Ackerman's memorial

service. Also, I just saw that the director of the National Library of Medicine is stepping down, retiring, after thirty years of contribution, [Donald A.B.] Don Lindberg.

The University of Minnesota and Stanford were a couple of the earliest successful candidates for the National Library of Medicine training grant program.

No, I don't have a simple explanation of where I think it's going. It's much more tightly integrated into strategically important aspects of medical schools, such as the translation of science. From that standpoint, its roots are in more fertile soil than some of the early programs had available to them.

DT: Certainly, there's a lot more faculty in the Institute now than there ever was in the division.

DC: Oh, yes. That was always one of the problems: there was no room for growth. In fact, if a faculty retired, that position would be retired as well. That was a fact not very conducive to growth and improvement until, finally, NIH said that informatics was important.

[chuckles]

DC: And their funding probably was even more important, not only NIH but the big chunk of funding for those that had a good program, they could access.

DT: Well, hopefully, this project will show that informatics here has been doing important work for a lot longer than since 2006. [chuckles]

DC: Yes.

DT: Do you have any final thoughts that you'd like to share about your career, about your time here?

DC: You make me think I should have something very insightful to say.

DT: No pressure. [chuckles]

DC: Thanks to some of the early folks in the informatics scene here, including Gene Ackerman and Laël—Laël has been tireless—ensuring that there are informatics opportunities and academic learning at this institution. I think all of us who've followed have a great deal of thankfulness and gratitude for their laying down the original foundation and pathway. I'm glad to see that informatics seems to be setting deeper and broader roots at this University. So I appreciate the leadership Connie Delaney and others that are moving it forward are going to accomplish.

I've had a good time and a lot of interesting experiences, met a lot of people, and visited a lot of countries. At the same time, I'm happy doing what I'm doing now, and that is

filling all those gaps and holes that develop if you have a focus on one thing for many years. That sounds kind of sad. I'm glad that I was part of the history of informatics at the University of Minnesota, was really was one of the first to get into.

DT: That's great. Thank you.

DC: Anything else?

DT: No. We covered a lot of ground, so thank you.

DC: Good luck putting this all together.

[End of the Interview]