MEDICAL LIBRARY ASSOCIATION

ORAL HISTORY COMMITTEE

INTERVIEW

WITH

BETSY L. HUMPHREYS, FMLA

Interview conducted by Joyce E. B. Backus

October 23, 2017

Edited by
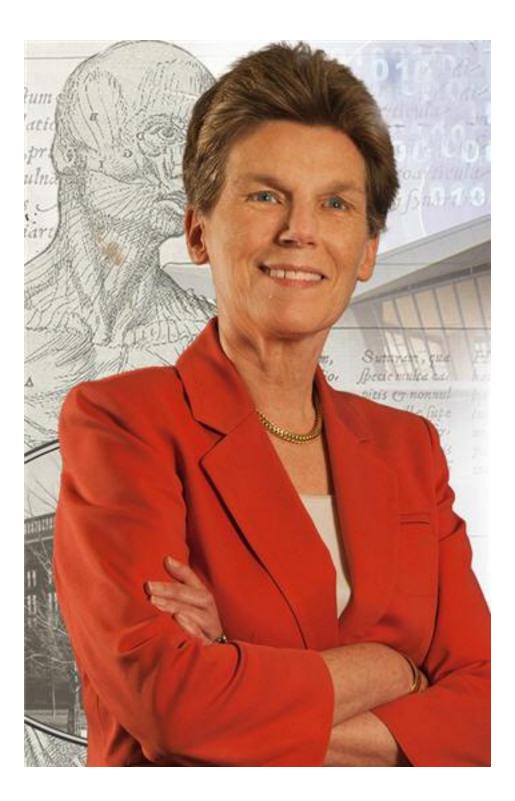Carolyn E. Lipscomb, AHIP, FMLA
Project Director
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Consent Form for Oral History Interview (2002 version)

This confirms my understanding and agreement with the Medical Library Association (MLA) concerning my participation in an oral history interview as a part of MLA's Oral History Program.

1. I agree to be interviewed by___*Joyce Backus*_____
on ___*October, 23   2017*_____. I understand that my interview will be recorded and that a transcript and edited version of my interview will later be created.
I understand that I will be given an opportunity to review and edit the edited transcript before its release.

2. I hereby grant and assign all right, title, and interest to any and all recordings and transcripts of my interview including copyright [and all rights subsumed thereunder] to MLA. I will be given a copy of the edited transcript for my personal use. I understand that the transfer of these rights to MLA confers no obligations on MLA to promote, market, or otherwise make publicly available copies of the interview.

3. One or more edited and/or condensed versions of the interview, approved by me, may be disseminated by MLA, as it deems appropriate.

4. I understand that the original, unedited recording of my interview and the original unedited transcript will be maintained in the MLA archives at the National Library of Medicine, or at such other place as MLA may reasonably designate, and may be made available to researchers who have demonstrated that they have appropriate qualifications. I further understand that the original unedited recording and/or the original unedited transcript will be made available with the following restrictions (Check one):

    ✓ No restrictions

    _____ The following specified portions of the interview will not be made available to anyone until _____.

___Betsy L. Humphreys_____   ___Joyce E.B. Backus____
Name of Interviewee   Name of MLA Interviewer(s)

[signature: Betsy L. Humphreys]   *[signature: Joyce E B Backus]*
Signature   Signature

Date *23 Oct 2017*   Date *23 Oct 2017*

Accepted by: *[signature]*   Date *4|13|18*
        MLA EXECUTIVE DIRECTOR

Biographical Statement

Betsy L. Humphreys, FMLA, retired as the National Library of Medicine's deputy director in 2017, having been appointed to that position in 2005. For sixteen months during 2015-2016, she also served as NLM's acting director. Humphreys coordinated NLM's extensive activities related to health data standards, serving as U.S. member and founding chair of the General Assembly of the International Health Terminology Standards Organisation. She contributed to the development of National Institutes of Health and Department of Health and Human Services policy on a range of matters, including health information technology, public access to research results, clinical trial registration and results reporting, and data science.

Humphreys joined NLM in 1973 in the Serial Records Section; she led the effort to automate management of the library's serial publications collection and was instrumental in the inclusion of hospital libraries in the national holdings database. She held a series of increasingly responsible positions, including chief, Technical Services Division, deputy associate director for library operations, assistant director for health services research information, and associate director for library operations.

Under the leadership of Donald Lindberg, she collaborated with partners to expand the mission of NLM in several areas, including the establishment of the National Information Center on Health Services Research and Health Care Technology. Humphreys organized a seminal meeting of the public health, informatics, and library communities, which influenced the growth of National Network of Libraries of Medicine programs in public health. From 1986-2006, she directed the Unified Medical Language System project and negotiated the U.S.-wide license for SNOMED CT.

Throughout her career, Humphreys worked with the library community for the mutual benefit of NLM and health sciences libraries in improving health care information. She highlighted the role of hospital librarians through a satellite broadcast aimed at health care administrators and physicians. She supported new roles for librarians and career development programs such as the NLM/Association of Academic Health Sciences Libraries Leadership Fellows Program.

Humphreys is an elected member of the National Academy of Medicine (previously the Institute of Medicine of the National Academy of Sciences) and a Fellow of both the American College of Medical Informatics and MLA. MLA also awarded her the Janet Doe Lectureship in 2001, the President's Award, the Marcia C. Noyes Award in 2007, and the Carla J. Funk Governmental Relations Award. She received the Morris F. Collen Award of Excellence from the American College of Medical Informatics, considered the highest honor in the field of medical informatics, the first Cornerstone Award conferred by AAHSL, and the Presidential Rank Award, Distinguished level.

She received a BA from Smith College in 1969, which awarded her the Smith College Medal in 2012, and an MLS from the University of Maryland, College Park in 1972.

Medical Library Association Interview with Betsy L. Humphreys

[MP3 File #1]

JOYCE E. B. BACKUS: This is an MLA oral history interview with Betsy L. Humphreys. Today is Monday, October 23, 2017, and we are at the National Library of Medicine on the National Institutes of Health campus in Bethesda, Maryland. The interviewer is Joyce Backus. First we're going to have a few questions for Betsy about her background and education. So, first, what influenced you to go into librarianship?

BETSY L. HUMPHREYS: It was a pretty prosaic thing. I knew I wanted to be working. I knew I wanted to do something that I considered to be socially valuable. I had done some practice teaching and I had decided that was not for me—even though, obviously, clearly, socially valuable, that I wouldn't enjoy it. I knew for sure I did not want to be a health professional. And although my father was a businessman and my uncle was a banker, it had no appeal for me to be in business or finance—none.

And then there was the issue that I married just before the end of my senior year of college, and my then-husband was serving in the Navy. He had another couple years to go. His degree was in civil engineering, and it was unclear to him and to me where or what he would end up doing. I thought, well, probably anywhere he would end up, there would be an opportunity for me to get a degree in librarianship, and whatever happened in the initial trajectory of his career, I probably would be able to find some congenial work in that field. So it was really a very traditional choice.

B: So how did you end up choosing medical librarianship?

H: Well, I didn't; it chose me. I was getting my degree at the University of Maryland. Although they had an outstanding course in health science librarianship taught by Winnie Sewell, whom I later knew and totally admired, I didn't take it. I was more focused on organization of knowledge, information retrieval, technical services, special librarianship—so I did take those. But I didn't think I was going there.

And then it was just serendipity. One of my adjunct professors was Sal Costabile, who had previously worked at the National Library of Medicine. He had left NLM as, I believe, the deputy chief of technical services, and he had gone into, I think, museum or association management. And then, of course, he became well known to whole other generations of NLM employees who didn't know him when he was originally here, because he put together a very successful contract library services company and for many years provided services to NLM. He was called, and they said, "We need some people over here. We'd like some recent library graduates who can work on special projects. And we would really like these people to start in January." There were a couple of things. He knew me from his technical services class, and we'd had a fair amount of interaction. But also, I was actually graduating at the end of December. I had gone through the year taking courses in the summer, as well as in the spring and fall semesters, so I was getting my degree in December of 1972, and they wanted people as soon as they

could get them. He referred me over here to be interviewed for one of those jobs, and I got it.

B: You said your library education was at the University of Maryland. How do you think your library education differed from what people get today?

H: It's interesting. I saw that question and thought, what do I know about what people are getting today. So I actually went and looked at the University of Maryland. I thought, well, that's where I went. Of course, they now have an iSchool, and they give multiple masters. They do have a single PhD program, which can be any of those areas, I guess. And they had that; they had a PhD program when I was there, although the school was relatively new. It had just started, I think, in [1965], and there I was there in '72. So well within the first ten years of the school, I was there.

It was very interesting to me to look at this, because clearly, there's a lot more specialization, and there's a lot more different aspects of technology. But I didn't see very much, in all of the different programs, that there wasn't a bit of in the program that I took. They were taking a very information science as well as management of libraries and library services approach. They had quite a bit about different user populations and needs. They were interested in diversity at that time already in services to underserved populations.

Although there was not yet an internship program in other schools, there were a number of the courses where, in order to pass the course, you might have to do a project for a library in the area—something that would get you out there. I don't know that it was always true in Sal's course—but he suggested to me, when I was doing a project, an idea that was of interest to him, and he talked to me about it, and it was of interest to me—that I do a comparison of the workflow of ordering and processing books between a university library and a bookstore. There was the college bookstore in College Park and there was the main McKeldin Library, and I did that.

In my special libraries course—it was taught by a fabulous woman, very well known in that field and really a powerhouse, Sarah Thomas Kadec. When I knew her, I guess she was Sarah Thomas and Kadec was added later. She basically required you to find a special library and do something for them. I ended up doing something at the Urban Institute library. They were looking at the acquisition of some new type of technology to help them produce their catalog and catalog cards and maybe have some automated records. So I did that project for them, and it was very interesting, because the woman who was the head of the library later came to work for NLM as a cataloger [Anna Lisa Warga].

When I looked at what was there [then and now]... Ben Shneiderman was already there, I believe [editor's note: he arrived at the University of Maryland in 1976]. Now they have a big thing on human-computer interaction, but they had a very strong computer department at that time, and there was a lot of interest in that. If you took the library automation course, you did your rote programs and they were pretty minor, but... So it's

interesting. I feel there's a lot more to know in all of the areas that I had covered, but the coverage of it, at the level they could cover it then or what was known or what was of interest then, is not all that different, actually. I'm not sure that they had an archives program, though, but they clearly focus on that now. I'm not sure about that. They might have.

B: You mentioned Sal Costabile and Sarah Thomas. Are there other memorable teachers from those early days?

H: Dagobert Soergel. He taught the information storage and retrieval course. They probably had an indexing course as well, which I didn't take. And I will say that the organization of knowledge, information retrieval, storage, structuring of knowledge, the cataloging and indexing part of that curriculum was excellent. He was more on the retrieval end. Marcia Bates, who later went on to, I think, be at the Berkeley library school [editor's note: her degrees were from Berkeley, and she was later a faculty member and department chair at UCLA], and Hans Wellisch, very well known in cataloging, they were all teaching at that time.

They took an approach to it in general which I really appreciated, which was a real focus on the theory underlying the practice, and projects and exercises so you could know there were various ways of applying the theory and different systems that were used in different places, and one system of trying to do that might be better in one case than in another.

You were doing things like cataloging books using different subject headings, looking at LC classification, but also looking at how you would do the same thing with Ranganathan. So not just, here's a practical way to do it, but what's the real purpose of all this and think of the different ways that it could be done, and what's good and what isn't so great with some of the big different systems that are under use.

B: From the University of Maryland, you described how Sal Costabile recommended that you consider a position here. Can you tell us a little more about how you became a librarian at NLM?

H: Well, I came over to be interviewed. It was extremely laid-back. The person interviewing me was Seymour Taine, who was at that moment, and for a very short period, chief of the Technical Services Division. But he is someone who had had a very distinguished and influential career at NLM before that. He had been [project director, Index Mechanization Project] and [chief of the] Bibliographic Services Division. I'm not sure I have all of his positions. But he was one of the original people working on the index mechanization and the original implementation of MEDLARS.

I think that at that time, when Joe Leiter was associate director [for library operations], Seymour Taine had left NLM and had become head of the NIH [National Institutes of Health] library. And for whatever reason, he needed to leave there. I don't know what the circumstances were. But I think in some sense, [NLM director] Marty Cummings

was thinking, well, here was someone that we…, and Joe was quite interested in having him come because he felt he was a very effective person.

What Joe now wanted to do was to fix technical services or get it up to a better position, because now that we had MEDLINE, the delay in acquiring journals and the fact that we had gaps in the collection and weren't getting everything—it was much more obvious to people. You go online in MEDLINE and well, okay, the most recent thing from this journal is how old? That still strikes us today. On the other hand, the most recent one today is likely to be a heck of a lot more recent than it was at that time.

So he hired Seymour. Joe told me later, he was very interested in this and was thinking that Seymour could really be helpful. But Seymour did not stay very long. Very shortly after he became chief of technical services, he accepted a position to be head of the World Health Organization library in Geneva. I think Joe sort of felt that this probably was in the works, and he was disappointed that this happened.

But Seymour interviewed me, and he literally said to me—I have been quoted as saying this before—he literally said to me, "Well, we have some special projects, and we're looking for people who can think and write." And I said, "I can do that."

B: So how did that first position influence the rest of your career?

H: Well, the first position that I fell into… So I arrive and I discover that they haven't actually decided what they're going to do with me. I arrived the first week in January [1973]. For that first week, they kind of gave me things to read or whatever and I'm sitting here saying, is this really going to be useful to me if I don't actually do any work while I'm here?

At the end of that week, there was a meeting, which I was not present at, where Cecile Quintal, who was the assistant head of serial records, and probably Bill Plank, although Cecile was the one who was working on this, had [brought me up] with Joe Leiter and some others. The issue was how they were going to move forward the SERLINE project, which was nascent at that time, and what was going to be done and how they were going to work on it. There was a decision made that it had to move forward and had to move forward as quickly as possible for all these political and other reasons, and okay, they had this person down there they could put full-time on the project. So I became full-time in helping clean up the data that had been sent to NLM from the Medical Library Center [of New York] and add stuff to it, so that we could have SERLINE.

There was the question of what SERLINE would contain when it first came out. Clearly, all the *Index Medicus* (IM) and MEDLINE titles had to be in there. And the special list titles, the nursing and the dental, and that all had to be in there. And they wanted to also have biomedical titles that were covered by other major indexing and abstracting services, so that would have been *Chem Abstracts* and *Biological Abstracts*, and to a lesser extent, *Science Citation Index*. We were going to take all of them. *Science Citation Index* was at that time indexing, I think, fewer titles than were in MEDLINE. I

could be wrong about that, but I think I'm right. Of course, they were covering a broader scope. My goal in life was to look at all the records that we had, determine whether things were missing, update records to indicate which ones were covered by these different indexing and abstracting services, including IM but the others as well, and by and large try to find duplicates or incomplete information and fix it up.

I was going to do this using the Inquire database management system (DBMS), because a decision had been made that the quickest way to do this was to load the data that we had into the DBMS and make the corrections and changes to it there, and then once all that was done, it would periodically be output as a file that could be loaded into ELHILL.

This was a huge education for me in that I learned a tremendous amount about the structuring of data and this particular database management system, which was to last a long time here at NLM and be used for a lot of good things. I really got a picture of dataflows and systems from the point of view of, well, you could maintain it over here, store it over here, you could output it a different way, you could use the database as the source of printed or microfilm or other database products.

It really gave me practical experience with a whole lot of things that are pretty important when you're thinking about being in charge of automated systems. I knew this thing from multiple levels, which I don't think I would have if I had not had that experience, and literally spent large amounts of my time, if not all of it, the first few years at the end of a terminal making changes to things or writing reports that ended up being printouts in the reading room or orders for this or whatever.

It was really a tremendous experience, and as I have also said before, it was really a tremendous experience because of Marie Pinho, who was somebody who had thought the whole idea of having this DBMS was to empower people who were closer to the data to understand the system and to make these changes. I think in some ways, she wanted to show that this approach was going to be very valuable, and here was I, and I was the person who wanted to know how it worked or why was this… or "Marie, what about this." And she was the one who said, "Well, Betsy, now that you've figured this out, why don't you write it down," or maybe we sort of came to that together. I really learned a tremendous amount from her. It was very valuable.

The other thing I learned from my early years was the approach of looking at problems from a size point of view: How big is this problem? Oh, we're going to have to add ISSNs [International Standard Serial Numbers] to everything, or we want to go request them. Well, how many is that? Well, we've got a real problem; there's A, B, C. Well, okay, that's a real problem for A, B, C. How big is A, B, C? And that was a real focus of Joe Leiter. And Lillian Kozuma was another person. I didn't work so much with her directly, but it was the same approach. She was more working on the cataloging side. It's the issue of, sure, these are all problems, but how many people does this problem affect.

An example that I wasn't personally involved in but always struck me as so brilliant was Joe saying, in terms of interlibrary loan, "Why are we spending so much time on the difficult ones? Why aren't we making sure that the bulk of these things get processed much more quickly?" And those were changes that Berky—Al Berkowitz—and Sheldon [Kotzin] were involved in making. Well, okay, it's fine to work on the serious, hard problems, but we have to have a very smooth workflow here that gets the majority of it done, and also, if we can't do that, because people are asking us things in bad ways, like they're not giving us complete information, as required by an ALA standard request [ALA Interlibrary Loan Request Form] or whatever, then we ought to throw it back in their faces. Because we need to be able to process and serve this large crowd, and if people are sending us puzzles instead of clear requests for things, well, then, why don't we say, "That's your problem"? Or working through the network [Regional Medical Library Program]: Do people need training in this? Do people need to understand this? What can we do to make it easier for these people to make a request that is easy for everybody else to process and fill?

And that kind of approach to problems in a large production shop—I think whether I was working directly on some of these things or not, many of them not—it sort of permeated the place, which is, okay, let's really analyze this problem. What are the categories of things we're dealing with? If this is the biggest category, what do we do to make that one work, and then we'll move on to the next. And I think that that has been a good way to approach problems. But you probably know that that's very ingrained at NLM in a lot of different areas, I think.

B: What was NLM like when you arrived, and what was the state of automation? You've described a little bit about how Inquire was coming in. Do you think this problem-solving approach… what was the state of it? Where was it in that process?

H: Well, it was really at the beginning in the use of it, because, essentially, all the focus on automation at NLM had been on automating the main product, which was *Index Medicus*, and then making those data even more readily available by online technology and of course the brilliance of marrying the online to the nationwide telecommunications networks as those became available.

The idea was, we're not doing all of this to make it easy for the people at NLM; we're doing it to provide a more current, up-to-date service. But the realization now had struck that if we didn't make it easier for the people in the back room to do their job effectively, then if we didn't have a subscription to *JAMA*, maybe we wouldn't get it. If you're not paying for things, it should come as no surprise that you're not receiving them, but if you can't tell whether you're paying for them, if it's a huge thing to even find out whether NLM owns a title or has an order for it... It is not an exaggeration that when I first came here, if you wanted to be absolutely certain that NLM did not have a monographic series that had started publication in the 1960s, it could take you easily twenty minutes to search every place to have a definitive answer that we didn't know about this and we didn't order it. It could easily take you that amount of time. It was ridiculous because this was

a huge place; we were acquiring all this material. We had no automated support for the acquisition function.

I think this was something that struck Joe with a blinding light, and he wanted to get it fixed. He had done a bunch of stuff related to indexing contracts and getting that all in better shape when he first came over in the mid-'60s, but now, by the time I arrived, he was at the point of saying, "Well, we really need to clean up technical services so we know what's going on, and we need automated support for this." So it was a very exciting and interesting time, because between 1973, when I arrived, we automated all of the serials and monographic acquisitions and to a certain extent invoice processing—and this was all done between '73 and about '81, '82.

Also during that period, NLM started work on automated indexing, because what was going on before, both in cataloging and indexing and online cataloging, was these people were sitting at typewriters and in essence creating records on keypunch forms, and then those records were going off to be keyboarded to create the MEDLARS cataloging and indexing records. And it was not an easy task. There were the double special character combinations for the umlauts. It was all being done on a typewriter. And I would say that in the ten years after I came—I wasn't involved with all of these activities; Lillian, Sally Sinn, Dan Tonkery, and Becky Lyon, a lot of people were involved in the process for monographs and stuff. That was a ten-year period where we did that.

And of course, making the decision to do the retrospective conversion of the NLM catalog, we had cataloging records in machine-readable form from the mid-'60s on, when MEDLARS was implemented, but we didn't have it for everything before. NLM's decision to make that change was done in the late '70s, and pretty much all of the retrospective conversion of the catalog was done by about '81, '82. That was very early for a major research library to have done that amount of conversion.

B: Staying with this theme of how systems evolved and how NLM changed the way we handle things, can you describe your influence and participation in the way NLM and the network handled our serial holdings?

H: Yes, I can. I think that part of the thing that I became involved in, in addition to coming up with a plan to automate the rest of NLM's serials processing based on what I knew about SERLINE, which, again, was an outward-facing thing. The SERLINE file was going to contain information about which of these important biomedical titles were held by libraries across the country. Again, it was to support interlibrary loan and access.

But as we got familiar and expanded the use of Inquire for this purpose, and I kicked around these ideas with Marie, we said, we really could automate a lot of NLM's internal processes, certainly the ordering, gap-filling, binding, and whatever. We could provide support to that using the same software. We would have to use this new multi-file feature, but we had ideas about how to do that. So we came up with this proposal.

B: So from the beginning, SERLINE was supposed to include holdings for both NLM and the network at the title level?

H: Yes. It was essentially supposed to include, first, location symbols, that is, not the holdings, but just the fact that XYZ library held it. And of course, that was a problem because people had union lists that did have holdings, so this was, in their minds, a step backward. The other thing was that the whole notion of building SERLINE and doing it that way had to do with NLM spending money to assist in the development of union lists across the country. Joe Leiter decided this was an untenable activity—that it was costing a lot, but it wasn't a systems approach to the problem. So SERLINE was kind of an interim thing, which would be cheaper for NLM to do, and he was trying to convince everybody that it would be good enough. But they were not convinced, because it didn't actually have the holdings data and it didn't have all the same things. So it looked to them like NLM used to support something that they found useful and now was diverting funds to do something that was not so useful. And that's not actually a totally wrong characterization of what was going on.

But as we were doing this, my thought was, look, NLM is in a bad way by not having automated records for all of its serials. And of course, it didn't, because many of the serials that mattered had been cataloged long before the mid-'60s. These things had been around for a while—*JAMA* and the *British Medical Journal*. So we had this bibliographic record for 6,000 titles, most of which NLM owned, probably all of them, and SERLINE. But NLM had subscriptions to somewhere between 19,000 and 23,000. Hard to judge if you don't really have good records, but it was somewhere in there. It was a lot more, obviously.

It occurred to us, looking at all this—this is not the systems approach. If NLM would just have an automated record for everything it owned and maintained, part of just knowing that—okay, this title has died, we're no longer going to subscribe to it—if it was being maintained so that NLM had control over its own collection, then we could just add holdings data to it. But right now this creation of SERLINE was an added task for NLM, and it wasn't doing anything to assist us in making sure we had a subscription for things. It wasn't helping us with inventory, it wasn't doing any of this, because it was too small to do that. So it was like an added thing. We were spending time and money on it. Granted, it wasn't huge. It was solving, sort of, but not in a great way, this problem for the network. But if we would just hold off a minute here and automate all of NLM's things, and then add the data out there to it on top of this, and make use of this information to ensure that NLM was getting everything it should get and other activities, well, then we could have all these other efficiencies.

We had another serial file for the items that were being currently indexed so that we could print the *List of Journals Indexed in Index Medicus [LJI]*. Well, I'm sitting there saying, "This is nuts." We have this thing that only has that; we have this we're building for this purpose and it isn't really serving it. If we could just automate the whole thing and have all of this coming off it, it would be better and we wouldn't be doing these things multiple times. Once would do it.

We came up with this idea of how we were going to structure this, and I cannot remember selling it to Joe Leiter, but he was enthused. But I do remember the classic story of me going into a room with Joe Leiter, Marty Cummings, and Mel Day, who was Marty's deputy at that time. I don't know whether Marie was in the room or not; I really don't know that. But I'm presenting what we're going to do with this, and Marty asked a few questions and he leaves, and it's okay, we're going to do this. I found out later that it had something to do with Marty wondering who was going to do this, because the head and assistant head of the Serial Records Section had recently both left, and this was 1975 when I was giving this briefing. I had been at NLM for two years. And what was I at the time, twenty-seven, twenty-eight years old? So I had these two or three years of experience. Who was going to do this? Part of it was for him to look at me and know who I was and whether he believed I could manage it. And the other part was that he had been under some level of criticism across the board at NLM about not really interacting with the rank and file, people who were further down. I guess these two things came together, and there I was.

But it's always been my way, and maybe I didn't even know it was my way, but I early figured it out at NLM, but it just always bothered me when there was a problem and somebody would say, "Yeah, we have a lot of problems with this. The records don't seem to be accurate" or whatever. And I'm always sitting there and thinking in my mind, "Well, what is wrong?" Why are we just sitting here shrugging our shoulders saying, "Well, these data are very often wrong"? Why aren't we over here figuring out why are they wrong, and what is it that we could do collectively to be sure that they were right?

This notion that I'm spending my life on SERLINE and it isn't helping this situation with NLM at all, and then somebody over here is also editing the same bibliographic record so that it will be right—or data, some of it, limited—but so that it will be right in the next edition of the *LJI*, it was kind of like, there's got to be a better way.

And that has sort of followed me. I was more hidebound about it when I was young and naive; that is, having this view that all duplication or all overlapping projects was a terrible idea. And I learned later that that's not true. In a place as big as NLM, if you want innovation, then you've got to put up with a little raggedness. If you make every single person who has a great idea go through a whole bunch of hoops and figure out how you're going to eliminate all duplication before we can even find out whether what they're doing is good and should be added in or should become the prominent thing, you never get anything done.

But the one thing I feel is the biggest sin is intelligent human beings creating the same data more than once, especially at the same place. I hate that. I feel that's different from people figuring out independently—coming up with research about how they could have a better algorithm for making sure that the data is higher quality—and then you can put that wherever it makes the most difference after you figure out whether it's worth it, or there is more than one way we could do better with these data. We could link them to some other data and provide a new service. Well, that's okay. In the meantime, we don't

have to create the data again. But in the early days I felt everything should be more logical, that duplication was a sin. I learned to moderate my position and only feel that certain kinds of duplication are a sin. Two independent groups of very smart, very well educated, knowledgeable experts working on creating the same data, that still to me is a great sin.

[MP3 File #2]

B: I'd love for you to talk a little bit about whether you had a career path in mind and how you took advantage of opportunities along the way and how the positions built on each other.

H: I didn't really have a career path in mind. I loved the work I was doing in those early years, and I was already totally, in a way, addicted to NLM's mission, to the notion that if we did things better at NLM, then we could be providing a platform on which a whole lot of people could do things better and at less expense. I really thought this was great. And the notion that I could work on something that could suddenly be beneficial to libraries across the country and their users was really enticing to me.

And I actually liked the content of the work. I liked all of it. It's very interesting. I liked the special feeling I had when it suddenly occurred to me that—and I started working more on the idea—if we just automated NLM stuff, then we could add the stuff on and the whole thing would be more efficient and we could do these different things. And the part of it where I said, well, okay, how could we do that in Inquire. We would have to have these different files that were structured in different ways, and I could think about the database structure and how this one would have to connect to that one; and then the issue of working with what was really rather a complicated but very, very powerful report language. It was like solving a puzzle to figure out this and to interact with people and say, "Well, wait a minute, could we make it do this? Could we do that?" I liked all aspects of it. I liked the aspect of working with the people outside, even though I was sometimes feeling that they were not taking a broad systems approach, that they were worried about some little detail and that was not the important one. So I loved the content of the work.

Then different positions began to open up. I was assistant head of the Serial Records Section within not a large number of years, a few years of my coming here. And then the head of the Serial Records Section also opens. But that was an interesting one. I think because I had been very successful with automation and so forth, if I had wanted that position, I might have gotten it.   I think I did myself a favor by thinking I was not qualified for it—I had done technical direction of people, but I really hadn't done supervision and management—and that I needed more experience, and I needed some mentoring in that area. There weren't a whole lot of great mentors in that area right near me at that time. There were a number of people who were really great at their jobs, but in that sort of thing, better ways to... I could look around and determine some ways that I would not do it if I was there, and I looked at the way certain people did certain things

and said, "Okay, that's good. Never do that." But in terms of advice and how to go about it...

So I was really grateful when Elizabeth—Liz—Myers was hired as the head of serials, because she had a lot of experience. She was substantially older than I was, probably by twenty or thirty years—twenty years, anyway—and she had a lot of experience. She had really good ideas about developing relationships across departments and going out of your way to get to know people and what their issues were and so forth. I had quite a lot of that, but it was always focused on the project that I was on. It was like I was triaging. I wasn't sitting down and having lunch with people and asking what was on their mind. I was meeting with them and trying to get their input or hear their problems as it related to something I was doing. But that doesn't open your eyes as much. She was very good at that.

She was the one who said, "You have to join professional organizations." She said to me, "You should be an MLA member, you should be an ALA [American Library Association] member. This is important to you. It's going to be useful for your career to do this. Do it." Very, very good advice. So that was very helpful to me. Watching how she handled some very difficult personnel issues and the fact that she was not afraid of doing it was very good training for me.

By the time she left, she was both the deputy chief of Technical Services [Division] and the head of Serial Records. These positions hadn't been one position, but we were in one of these times when we were de-layering or we were doing whatever we were doing pursuant to some broader goal across the library—probably across NIH or the government—and it really was not a very sensible thing. These were both big jobs. There was a lot to do. When she left, they made the correct call that they were not going to try to recruit this as one job. I decided that the job I wanted was the deputy chief of Technical Services—that that was going to be more interesting to me and give me greater scope and just get me into some additional things that I felt I could work on that would be exciting and interesting to me. I applied for the job and I got it.

Then, in rapid succession after that, the chief of Technical Services became vacant. Someone was put into that job for a brief period of time, and was a person with a lot of talent, but a classic case of the square peg in the round hole. Really not suited to that job but capable of doing a lot of things. So then I applied for that job and got it. This was one of those cases where they posted the job at two grade levels, which used to be more common than it has recently become because of issues around doing that. I would not have qualified for a GS-15 job based on where I was and what I had done before, but I would qualify for a GS-14, so it was posted as a 14/15 and I got the job.

That was really an exciting and interesting time. We were doing a lot of stuff related to holdings. We were seeing the fruition of getting the database to the point where it would actually underpin DOCLINE. Now we were on holdings. And, of course, in this period of time, I was one of the people who was writing the MEDLARS III specifications and how we were going to make changes there, now that we had a better clue about what

would really streamline processing and reduce redundancy. We were going to do that with the next version of NLM systems.

The next step for me was to become deputy associate director for library operations, which I became in 1984. Joe Leiter retired; Lois Ann Colaianni was selected as the associate director. This took some time. We all know how long it can take, particularly when someone is coming first into the Senior Executive Service, which she also was doing at that time. And then she posted the deputy position. She had, in my opinion, a slate of candidates that most people would be thrilled to have, and I was delighted that I was selected, although I did not actually think that it was a done deal at all, considering that I knew who the other candidates were. Great people. And the preservation thing was one of the very first projects that I had as deputy associate director for library operations.

B: Tell us a little bit about the preservation program at NLM and how that began.

H: Lois Ann was a great believer in strategic planning, and Library Operations had a strategic planning exercise activity while I was chief of the Technical Services Division. It had relatively recently concluded, where she was using the strategic planning as a team building activity, trying to get her senior staff more into a team approach than they had been previously, due to a different management style from Joe Leiter. It was that kind of an activity.

It wasn't so much bringing in people from the outside. But she had experience with a facilitator. She had maybe met this facilitator through ARL [Association of Research Libraries], maybe not. Maybe it was somebody who Shirley Echelman, who was [executive director of ARL and earlier MLA] recommended. But she consulted and brought this guy in and interviewed him, and he was very good. He was also very good at providing actual feedback to all the members of the group about what was effective and not effective about their interaction with the group.

I learned something very important from him. I don't always act like I know it, but I learned it from him. It was very interesting. He said to me, "At first I thought you were ignoring what other people were saying and were just going on with whatever it was you wanted to say. But then I realized that you hadn't ignored anything that anybody said, but in fact, were putting this together and then saying, 'Oh,' and going to the next place, but never acknowledging it publicly. You had to follow your line of reasoning to realize that you were really building on so-and-so's idea, plus such-and-such's idea, and had really been inspired by them and obviously thought it was a great idea—because you *never* said it. You just went there." And obviously, saying it is much better than not [laughter]. And I still don't remember to do it every time, but I do it more than I used to, let me tell you. So this was good.

One of the things that came out of this—and Al Berkowitz—Berky—was just so pleased by this—was that NLM really had to have a more solid preservation program. We really had to have an emphasis on this; we had to figure out how to expand it; we needed to

figure out what resources were required; really we needed to study this thing. And Lois Ann, being our representative to ARL, knew that ARL had this self-study methodology which had come out to help people develop preservation plans, and also had a system where you could get a consultant, who was somebody who worked for or with ARL, to come and help you do this. There was a whole workbook and information about this. She apparently brought this, and in the aftermath of our plan, I think, showed it to some people in RSD, as it was called.

B: The Reference Services Division.

H: Yes. And for whatever reason, they didn't... Did they think it was overkill? Whatever—they were not enthused about picking it up and doing it. So, shortly thereafter, she recruited me [as deputy associate director for library operations] and I come up here, and she said, "We have this strategic planning objective and we want to do this. And there's an ARL planning process, would you take a look at this and see what you think." And I came back and said, "This looks like a really solid way to move ahead with this, and I think it would be great. We could do this."

She agreed, obviously—she had thought so all along—and put me in charge of this and coming up with a structure for it, which pretty much followed the ARL structure. We made some changes, but it was really modeled on the ARL structure. We ended up with this overall steering committee and independent groups studying various things. In addition to chairing the overall steering committee, I, myself, chaired the governance group, or the group that was looking at organizationally where should it fit in the organization, if we were going to do these things.

Everybody did this fabulous job. We had people who were doing a real survey of the condition of the collection. Carol Unger was involved with that. Really tremendous work. I think it was Mark Rotariu—who was at that point our budget officer; he was somebody who wanted to get some additional experience in other areas, and I guess the executive officer—it might have been Ken Carney at the time—talked to Lois Ann about this, and she said, "Fine." He had been working, in addition to being the budget officer— he got some backup AO [administrative officer] work for some of our divisions to get that broader experience. He was the one that was involved in surveying the issues related to the environmental conditions, and that group did wonderful work. And it might have been George Thoma, I don't know, who was one of the people working on the issue of what were the preservation technologies. He was obviously looking at it more from the point of view of the digitization and electronic part of it, but we had other people who were looking at various and sundry things. It really was a great group.

It was a very good job, and Lois Ann was very pleased with it, and so was Don Lindberg, because we started it just around the time he was arriving, maybe just a little bit in advance of his arriving, because he arrived in '84 and I became deputy associate director in '84. He was very impressed by it as well and used it as the basis to get money added to the NLM budget. Also, he was very enthused about this notion—again, the systems

approach to the problem; he was completely there as well—he was very enthused about this issue of let's get the biomedical publishers to use permanent paper.

B: So, the acid-free paper effort also came out of that preservation work.

H: Yes, and I was involved with that. I called over to Pat Harris, who was the head of NISO—the National Information Standards Organization. Anyway, I called over to her and said, "Well, you have this permanent paper thing, but it's just for uncoated paper." We really want to push on this, and most of the paper we get is coated because it's necessary for the sharpness of the illustrations, color, copies of X-rays. You need that in order for the illustrations to be useful in the biomedical domain. And she said, "Well, funny you should ask. We would like to do this, but we don't have anyone to chair the committee." And I said, "Okay, I'll do it," because it seemed like it was something that we should go ahead with. [Editor's note: The ANSI/NISO Z39.48 standard was originally issued in 1984 and revised in 1992 to include coated and uncoated paper as "Permanence of Paper for Publications and Documents in Libraries and Archives."]

It was really the work of a large number of people to do this wonderful thing [develop NLM's comprehensive preservation plan], but once it had been done, we really had laid this out in a very good way and we had discovered that our situation was far better. Again, it's N. How many do you have? Our situation was very much better than the other major research libraries which had analyzed their collections. Why was this? Because such a high percentage of our collection was more recent. And, since 1962, everything had been stored underground. So although we would never say that there was nothing you could do to improve the environmental conditions, the collection at NLM underground had not been subject to the wild fluctuations of temperature and humidity that were very common in other major research libraries that were not built like this. We were to be sort of the bomb shelter and the collection underground. So the amount of badly deteriorated paper in the NLM collection on a percentage basis, and on an absolute basis, was much, much less than would have been the case at Yale or a university main library. Much less, in most cases. We looked at this and said, "If we set up a good plan and we go forward with this, we can get this all saved before it deteriorates," to a pretty close approximation, which was not something that seemed at all feasible for other people.

Again, with the systems approach, we were sort of enamored of this notion of [mass] deacidification. But of course, there turned out to be all kinds of problems with that. Our notion was, we would watch what happened at LC [Library of Congress], which had a big emphasis on and development of that technology and getting it in place. We have a special relationship with LC; we'll let them take the lead on that, and we should be able to get some capacity from them when it's all straightened out. Well, it never actually, really got all straightened out in a very good way, so we didn't go there. But in the meantime, we were doing the microfilming, which is not ideal at all, but on the other hand, it won't surprise me if, in the end, we digitize directly from some of that microfilm and we'll be able to do it.

B: We absolutely have been doing that, where the print doesn't exist. It's not our first choice, but we've been doing that, and it's good quality.

H: We'll be able to do it and it's better than losing it. At any rate, that was very good. And [preservation planning] was also something that gave me a lot of experience in the notion of, put all the points of view in the room. It's so important not to say, I know that this group or this person has a very different point of view, so let's the rest of us meet and decide how it's done, because we'll avoid the problem of having to deal with him or her or them or that point of view. I mean, this is such a bad idea.

At the same time as I was doing this—because people had all these different ideas about where this should be and how it should be organized... But in the end, after we worked through each thing and talked about the pros and cons and laid it out that way, everybody agreed that maybe there was one approach that was better than the rest, and that was having a Preservation Section and putting it in what might by then have been called Public Services.

B: I think it might have been Public Services Division by then, or maybe the renaming happened when the section was created.

H: It might have been. It was around that time. That's one of the things that, I don't know that I learned it here in the early days, because I think people were more likely to say, okay, well, let's take the three of us who agree and go in this room and then come back and then we'll fight it out with the others. And this struck me as not the appropriate way to get anything done.

B: One of the things that strikes me from your CV and having observed and worked with you as a leader is that you are not generally bounded by any perceptions of a title and what that title would dictate one does or doesn't do to move the organization forward. Can you tell me a little more about that?

H: It's kind of interesting, because I'm going to be giving a keynote at the combined [Medical Library Group of Southern California and Arizona and Northern California and Nevada Medical Library Group 2018 Joint Meeting]. They meet at the end of January. They asked me, and I said, "Well, that sounds interesting, and the timing is okay, but I want to be useful. What do you really want out of this?" It turns out their whole theme is about crossing canyons and navigating waters and boundary-spanning types of things. And I thought to myself, well, I have some things to say about that.

I really do believe that the worst type of boundary is the one you set yourself, where you say, well, this is my purview. And maybe we could do something good over there, but we can't go there. I feel there's no point to that. There are boundaries. When you go to the Atlantic coast, there's a boundary. If you can't swim or drive a ship, then you're not going much further. And certainly, for anyone in our field to think that today I'm organizing information for this organization and next week I'm going to be doing brain

surgery is ridiculous. But within your own sphere, the things you know about and can contribute to—to decide that there are these boundaries and you can't go outside them...

There have been some people I admire a great deal who have on various occasions got up in front of the Medical Library Association, or groups of medical libraries, and made public statements, well argued, about things that medical librarians could and should do, in their view, and had really negative reactions from people—that somehow their whole being was under attack because somebody was saying, "Do something more."

That was the reaction people had when Lois DeBakey gave the first McGovern Lecture [1983]. She felt that medical librarians were very well equipped to help people write better, to be sure that communication was clear, to be sure there was adequate whatever. What she essentially was offering up as a potential role for the librarian was somebody who was going to be assisting with better searching of the literature, but also, the conversion of this—better understanding of what was a good study, evaluation of evidence. And there were people who were saying, "She wants us to do things we're not equipped to do." I didn't actually see it that way at the time. It's not that everybody has to do these things, but the negative reaction about it was very strange.

The next time I remember hearing something similar to this was when Roz Lasker gave the Leiter Lecture [2003: "Making Waves: The Untapped Potential of Medical Libraries to Improve the Public's Health"], and she was urging librarians to do more things in certain areas that would have been analysis of evidence and helping with this and that. Maybe she was into data; I'd have to go back and refresh my memory. But I remember that people were like, "We can't all do that, we can't do this." Now, I'm not saying everyone, but there was this reaction.

And you would have thought that Nunzia Guise was asking people to walk the plank. When she had her very strong message that it would be very useful for people to constantly update their skills, that it would be very useful for medical librarians to have more medical background and content knowledge and to get out of the library and be embedded in these teams, you would have thought... And now, if you go and read these rock star librarians profiles [published in *NLM in Focus*]—which are fabulous and that was a great idea, wonderful and well executed—everybody says, "Well, people think we sit in the library all the time worrying about the collection. We don't do that." And when she was saying you've got to flip things so that you're mostly dealing with the users and helping them with their things, and you've organized the management of the collection so that it can be done more easily, potentially, by people who don't have as much advanced education, you would have thought that she was just...

I really do feel that people set these boundaries, and they're not there.

B: Makes me think of your 'adjacent possibles'—what's possible.

H: Yes.

B: Because I think we heard it some also in consumer health, and we hear it now with data. We can't all be data curators and data librarians, and nobody is saying that. We're just saying, "This is the next thing."

H: I think that people have evolved quite a bit. But you go back to the beginning, early in the profession, there was a strong voice that librarians should also be involved and responsible for the organization of medical records. A strong voice, one of the very early directors of the Massachusetts General Hospital library, that was her view: this was a proper role. [Editor's note: Grace Whiting Myers spoke on "Hospital Records in Relation to the Hospital Library" in the *Bulletin of the Medical Library Association* in 1912.] I think you ended up with a situation where the academics—the people who were in medical school libraries—thought this was nuts. This was not helping the mission or what they were doing, the education knowledge and so forth, in that setting. And that was probably true, but that didn't mean that it wasn't something that might have been a very good path to follow and to promote, but the [Medical Library] Association didn't go there. There were people who advocated it, but then it was far later—decades and decades later—when we end up with Trudy Lamb and the clinical librarianship program. And even then it's not helping people organize the data, the records. But it is imbedding them, getting them out of the library and into the clinical teams.

So I decided that I would give this talk, and now is the time I have to really get organized to give it—I have a few months. I decided the first thing I was going to say was, "Don't create your own canyon. Don't set a boundary that makes no sense." [Editor's note: In the end, this idea was more indirectly stated in the talk.] On the other hand, deciding that you're going to solve every problem but the one you were hired to solve is not a very good idea, so I'm not really advocating that people decide, I don't really want to do this. As long as this is something that needs to be done at some level, you have to figure out a way to do this in a way that is meeting the needs of the organization and then go out.

I will say that this notion that you're working for an organization, what do they need, and that's what you need to deliver, was absolutely Sarah Thomas's thing. Being a special librarian for a specific organization is not the same thing as being a librarian in an academic institution, where the primary goal is to turn out people who are educated and can do research and whatever. Where it may be perfectly wonderful to be teaching these people how to do this better, that's not your goal when you're a special librarian. Your goal is to make this organization more effective and make sure that everybody has the information they need.

Now, the way to do that might very well be educating people to do a big chunk of this themselves, because you can't be everywhere at once and they all need help.

B: I think this is a good segue to the UMLS, which was about medical information everywhere, including clinical records, and how it would be connected, and a new adjacent possible for NLM. Can you tell us about the early days of that?

H: Yes. Well, as I have also said before, Don Lindberg came to NLM with a vague notion of the Unified Medical Language System [UMLS]. He had done something which I admire, and his approach to it I admired all the time I worked for him. He was always thinking about what NLM could do that would be really valuable that could not be better done or adequately done at another level. And he was looking at the infrastructure that NLM had created—the indexing, the cataloging records, the interlibrary loan system, the development of the Medical Subject Headings (MeSH), which allowed searching and analysis of literature.

And he was thinking, what could we do that would be similarly an enabling infrastructure that would help move ahead the field of medical informatics, which, of course, he was interested in. That is, medical informatics was looking at a whole lot of problems that would mean that existing medical knowledge and systems could come together in ways that would make it easier in essence for clinicians to do the right thing, for public health data to be analyzed across the board, health services to be delivered more efficiently to a broader population.

And the notion was, what could NLM do to make that easier? He went around and asked his friends, who were the leading lights in medical informatics, and focused on the issue that people, in building any system, were first trying to solve this terminology issue. If you were going to have an expert system that might provide decision support, well, how were you going to enter the data so that the computer could understand it.

Then, if you were over here with some information, patient records, or whatever, how were you going to find the most pertinent papers, even if you had it automated over here, that the person had A, B, C, or you at least have their billing records or something over here. And there was MEDLINE growing all the time over here, well indexed. How are you going to connect these things? And people were thinking about guidelines and computerizing them.

So he came with this vague notion that if we could relate this terminology in a way that could be used by systems as well as by people, then... And it *was* really a vague notion. I think many of us have dealt with Don over the years when he knows that there's something good we can do, but, the first time it occurs to him, it's not a fully formed idea. But he came with the idea, and his idea was, this was a multidisciplinary problem. It wasn't going to be solved by doctors or computer scientists or librarians or linguists; it was going to be solved by the interaction among all of them. He had a lot of experience dealing with multidisciplinary teams and had been in charge of an information school at the University of Missouri. He had a high regard for all of those different pieces, and he was going to bring them all together.

He wanted anyone at NLM, all the associate directors, the directors of the parts, to be personally involved if they wanted to or nominate people to be involved. Lois Ann nominated me, and it had, in some ways, to do with how I had worked on the MEDLARS thing and what needed to be done. And it also had to do with the fact that I had initiated this project to relate the Medical Subject Headings and the LC Subject Headings. That

was certainly not what Don was after, but it was a step towards it, and he was very interested in it. Anyway, he was very pleased that we had already been thinking about it.

That's another thing that I might have known but not articulated, not really understood as well. Don was always saying, start with something small, see if it works, and then grow it; or if you have something over here that really works well, and it's a step toward where you really would want to go, then expand off of it. It is very interesting, because he had grand visions, great, big ideas, but he didn't *ever* want to start by designing the grand plan to implement the great idea—let's get it all organized and then start. He always wanted to start down here with what we knew or could learn. And he was always making the assumption that we would only learn the best way to get there if we actually knew something about the next step up from what we already knew.

I am totally convinced that that is the right approach. You need the vision, but on the other hand, you can't say, there's my vision, now I'm going to put together a team of people so that we can do this, this, and this and have the whole grand vision, without any more information about what are the nasty little things that have to line up in order for us to get there.

It was a huge education for me, obviously, for me to be on that project. As I have also said before, Don knew that he needed people who had this different kind of expertise. I had a lot of expertise in terms of database design and also on production systems and things of that nature. It's important that whoever's leading the project, which he certainly was, is the one who's going to say, what are all the different talents I need, what are all the different backgrounds, what are the different kinds of expertise we need to move this forward. And if they don't think they need half the types of expertise that they really do need, you're in big trouble.

Once you have everybody in the room—or alternatively sometimes, people can worm their way in, but in this case it was unnecessary—who plays what role in moving a project forward, becomes not so much the knowledge that they have or the discipline they represent, it becomes other factors. Can she write? Does she have experience with contracting, because we're going to do this under contracting. Is she someone who is usually pretty good at seeing all the pieces and saying, maybe we can put these together and move forward in a certain way?

It was obviously a huge opportunity for me to be in some sense the executive secretary of the internal UMLS team and also the project officer on the research contracts. Very exciting, interesting time learning tremendous amounts. Just a fabulous opportunity; and also giving me an enormous network. I already had a big network across libraries and medical libraries and so forth, and this really added to my network.

Don Detmer was chair of NLM's Board [of Regents, 1989-1991], when he was put on to chair *The Computer-Based Patient Record* study at the Institute of Medicine. The original publication came out in [1991], but they probably had been working on it for a couple years. Don [Detmer], having been chair of the board, was quite familiar with the

UMLS project and was convinced that what NLM was doing was going to be very important. Don [Lindberg] and I were both put on this technical group. They had all these different teams and we were on this technical one. Maybe Don [Lindberg] was on the overall study as well, but I was on this technical thing.

That really started me very directly thinking about what was the same and different between standards in our field [of medical librarianship] and standards in the patient records field, and what did those differences mean and how could you move it ahead… What was the infrastructure that the UMLS was providing; what piece, if any, of the sets of problems that people saw about moving forward with electronic health records would the UMLS address; what were perhaps even the greater set of things that the UMLS would not address; and thinking about all that.

The people who felt that we should not have the agenda for the UMLS Metathesaurus, which is to relate all the existing systems and therefore help in terms of information retrieval and [conceptual] relationships and natural language processing—I felt we'd made the right decision; that that's what we should focus on there. But it wasn't solving many of the problems that people saw [e.g., lack of standard terminology for patient records]. Then I thought, well, now that I understand these problems better than I did, and I understand the fact that the UMLS isn't going to solve them, what can NLM do to help solve them, and how would that marry up with NLM's general agenda.

It was right around the time that we first got legislative direction related to health services research information and then got additional funding about it. One of the things that seemed evident to me was that having really good, more standardized electronic health records was really going to be a huge shot in the arm to health services research. Because you would have source data that would be better that could eventually be generated as a by-product of care, and then you would have a much larger and more robust set of data to look at issues like: why are some outcomes better than others, which approaches to delivering services really have the best effect, what are some of the gotchas in there that are preventing good care that we couldn't see, but now we're going to have these data and analyze them.

I immediately tied [the two together]—and Don [Lindberg] of course, was on board with this and it was in some ways an interchange with him—that NLM could define one of our goals as basically promoting the development of better, more standardized electronic health records, or electronic patient data, as a means of really improving the infrastructure for health services research. And, of course, it would improve the infrastructure for many other things as well. It became the rationale for why it was reasonable for NLM to step into this area more than it had been before. We were already stepped into it to a certain extent because of the UMLS and including things [clinical terminologies, coding systems] that were there. Way back at the beginning of the UMLS in the '80s, we were describing that our goal here was to be able to relate information from patient data to other kinds in order to support these activities.

[MP3 File #3]

B: I'd like to ask a little bit about the founding of NICHSR [National Information Center on Health Services Research and Health Care Technology] and the laws and how that came to NLM.

H: There were a number of threads to this. There was an entity established at the Institute of Medicine [IOM], which is strange in and of itself, because the Institute of Medicine is not a government organization. There was some legislation [that created the Council on Health Care Technology in 1984]. Morris Collen was put on [the Information Panel of] this group.

One of the things that the group wanted to do was improve information about health technology assessment. And a question you might ask: "What were they talking about? What health technology?" When you were talking to people at that time, you would get multiple answers to this question. Some people would say that every new drug was a new health care technology. So when they were talking about greater access to information and evidence, they were talking about what we've now got much better evidence with in ClinicalTrials.gov. They literally were talking about clinical research and the outcomes of it. Other people were talking more about things like, well, if you're in a metropolitan area, how many MRI machines do you need, or how many of X or Y new technologies can reasonably be supported. They were concerned about issues of increasing cost, as maybe the indiscriminate use of new technology, which was expensive and exciting but was not warranted for everyone who was being prescribed that device or that use of that new machine. The idea was, the council was going to look at what needed to be done in this area and promote it.

This group got under way not too long after Don became director of NLM. And Don, prior to coming to NLM, had one of the centers that were funded by what was called the National Center for Health Services Research. They funded centers in certain areas, and Don, at [the University of] Missouri, was funded to do exactly this—improve access to information about health services research, the results of health services research information needed by health services researchers. Actually, it was at that time that he talked to Marty Cummings about expanding NLM's coverage in that area, without immediate success. I have a feeling a lot of it had to do with competing priorities and also funding at the time.

Morris Collen is now in this [IOM] group. He is interested in the notion that people in the group are talking about developing new information services—resources, tools—and he's thinking that this is kind of an odd activity for the Institute of Medicine. It's supposed to be providing advice, not building things. He also is thinking that the people down there don't know too much about this, but Don Lindberg and the National Library of Medicine *do* know. So he said, "We really need to talk to Don Lindberg and NLM about this." Don talked to me about having an educational session for this group to give them an understanding of the different kinds of information, tools, or resources that existed or could be built, and something about the relative cost or incremental activity to do what they might want to be interested in. I came up with an idea of how we would do

this and who we would involve. We had this group that came out—or I went down there—and we presented this information to them. Because, really what they wanted to do is have something like PDQ for every type of evidence in the world. Well, this would, of course, be a wonderful thing. But the expense involved in this was enormous, and they had no idea. The other issue was, if they really wanted ready access to things, what about if there was expanded activity at NLM building on the delivery mechanism we already had, as opposed to something else. Well, they took this all on board. I think they were very impressed with NLM and the information that I and others provided. And Peter Reinecke, who had been involved in the legislation that set this group up, was down there. Do you know who Peter Reinecke is?

B: Yes, he was a legislative staff member.

H: [Legislative director and chief of] staff for [former senator] Tom Harkin. He is still involved with NLM because he contributes expertise and ideas to the *[NIH] MedlinePlus* magazine. So he was involved in setting this thing up.

As a result of me interacting with this group, I came to have interactions with the Association for Health Services Research [AHSR] and Alice Hersh. Alice had a strong view that there needed to be better access to research-in-progress in health services research; that this would be useful in terms of identifying where the field was, what the lacunae were, what was going on, giving people an idea of what was already going on. She was very interested in this. She came to meet with me. I think she was referred to me because of some of the people she was talking to who were on this council. And they said, "Oh, you should go over and talk to Betsy." She came over here with Don Steinwachs, who was at Johns Hopkins—I don't know if he still is, or is emeritus, but he was with the Health Services Research [and Development Center] out there—and he was at that time the president of AHSR. And Alice Hersh was the executive director. Fabulous woman.

Anyway, they came over, and I talked about the really checkered career of research-in-progress databases—going back to the Smithsonian and various things—and that from the point of view of NLM, if we were ever going to adopt and do something like this over time, we would need a demonstration of value. Because the issue was, was this really going to be valuable to the field beyond what our main thrust was, which was to index publications resulting from this sort of thing. And was there an efficient way to put it together; and if the information was scattered, was there going to be a reasonable way to assemble it and so forth. I thought I was bringing up some valid points and I was being helpful in the sense of doing that, but I really felt like I had not been wildly responsive. I didn't say, "What a great idea. NLM would do this. Probably we can." I didn't say that at all. Alice felt that I had been brilliantly helpful.

In the meantime, AHSR really had an agenda of upgrading the status of the National Center for Health Services Research, getting it up to a higher level and with a greater budget to support the field. All of this came together, because in the legislation [in 1989] that created AHCPR [Agency for Health Care Policy and Research] from the National

Center for Health Services Research and expanded it, this, I think, was the same piece of legislation where NCBI [National Center for Biotechnology Information] was inserted. I think it was. It was in the eleventh hour in 1988, and it was literally passed in [November]. [Editor's note: The Omnibus Budget Reconciliation Act of 1989 created AHCPR, and the Health Omnibus Programs Extension of 1988 created NCBI.] And, of course, folks at NLM knew that [U.S. representative] Claude Pepper was working on [NCBI]. But they had no idea that this thing was going to come out, giving NLM a role in collaborating with AHCPR; or maybe we'd heard something about it, but we didn't know.

In this thing, it said, okay, there has to be an IOM study to say what kinds of enhancements and improvements are needed, and NLM should fund this study with money given to NLM. The money is to come out of the AHCPR budget, so they were told to transfer [$300,000], I think, for the study, and additional money to assist NLM working with AHCPR to expand access to the results of health care technology assessments, [clinical practice] guidelines, whatever. [Editor's note: The 1989 legislation mandated NLM to work with newly created AHCPR to improve information services in the field of health services research. A 1991 IOM study funded by AHCPR recommended that NLM expand and develop services in health services research and train medical librarians in the field.]

With that happening, that's when we recruited Marj Cahn in [1991], and she became head of the Office of Health Services Research Information, which was within PSD [Public Services Division]. Of course, hiring Marj was a fabulous thing to have done. We get working on this, and Ione [Auston] is involved with this, and Kris Scannell is also involved with it, having had experience with a lot of this, and then Marj recruits Catherine Selden. Some of this might have happened a little later. We are providing support in coming up with what are the reasonable methods for doing these literature searches for the development of these guidelines.

Don meets with Jarrett [Clinton], the first [administrator] of AHCPR. They agree that of course we're going to collaborate and it's wonderful, but in order for NLM to pursue this, we really need our own direct authorization and budget for this, and everybody is in agreement that this is a good way to go. Alice [Hersh] is working on this and other problems. She gets in touch with me one time and says, "Okay, Betsy, if I can get this thing established—now, what would be a budget?" I came up with a budget of eight million dollars. I figured it out a certain way, and I described what we would need the budget for. And I inserted in there that part of what we would need the budget for was activities related to UMLS development and health data standards, because that, we felt, was really a pushing point to get better health data so that this would be beneficial to the [health services research] field. She swallowed this without any problem. I put all of this together on a piece of paper and went over to see Kent Smith, and I said, "Kent, I've just been asked this question. This is the answer I'm going to give. Is it okay with you?" He looked at it, and he said, "Fine, it looks good. Will anything come of this?" and I said, "I have no idea."

And then some bill is passed [National Institutes of Health Revitalization Act of 1993], and now we have named the National Information Center on Health Services Research and Health Care Technology [NICHSR], and the amount that is appropriated for us to spend on it, which was a second thing in the appropriations—suddenly we have eight-point-whatever-it-is million dollars added to the NLM budget for this.

And Don said, "Well, if these people have gone out and gotten us this authorization and this appropriation for this activity, then they deserve to know that someone who reports directly to me is on top of this program, and I would like that to be you." So I discuss this with Lois Ann, and that's what happened. [Editor's note: Humphreys became assistant director for health services research information, 1993-2006, while continuing in her other positions.]

Lois Ann was another great mentor to me in a lot of different areas—the way she handled things, the way she did stuff, the willingness she had to give you critical feedback when you needed it. She was great. And she really, in some ways, drew the short straw from having me as deputy associate director once the UMLS project started, because that occupied a third to half of my time. And the follow-ons in health services research and in stuff related to the standards, which was big for, really... I mean, I was on the UMLS project within months of Don's arrival and that was within months of me becoming the deputy associate director. So she really had less than 100% deployable resource in her deputy for the whole time that she was here, and it wasn't all that easy for her.

And it also was an interesting thing—and she handled it very well, and I believe Don did too—but it's not so easy when somebody who reports to you actually has more face time with the guy you report to than you do. Because Don was very interested in the UMLS project and bringing it along, and he did not want to be involved from twenty miles away... It's not that he was running everything, but we met regularly. And, of course, when you meet regularly with somebody and you're on the same topic over a long period of time, you get greater insight into the way the person thinks than other people do. So I have to say that I always knew that she was really in not a great position. It was very important to me to be sure that I was never undercutting her, just because I might be more frequently, for example, at an outside meeting about the UMLS, and Don would be there. I think Lois Ann and I, and Don, to a certain extent, all handled this pretty well, but it's not an enviable position that she was in.

Once we had this budget, then we converted Marj's office into calling it [NICHSR], and then it became a direct report to the associate director for library operations—in some ways through me because I was the assistant director [for health services research information], but it was reporting directly here; it was no longer under the other [Public Services Division] umbrella. It was mostly from the point of view of public perception. There was an assistant director for health services research information, so that was me.

Then, of course, there was the issue that I did exert some level of control over the budget. Don always felt that there was nothing that NLM did to which most parts of NLM didn't contribute in major ways. Given the arrival of an additional eight million dollars, there

had to be recognition that the activities that were going to be undertaken by this new group were going to have to be supported by OCCS [Office of Computer and Communications Systems]. It was all relevant, and we had to figure out how to apportion the funds. Of course, part of the justification for it had been activities related to UMLS, so a chunk of the money went there. We wouldn't have been able to move the UMLS project along as rapidly as we did without it, so that was great.

What the UMLS project did was give us expertise and understanding of all these terminologies, classification systems, and billing codes, from a perspective that no one else had. People were developing or using them, but they were not looking at them from what were their properties as artifacts from the point of view of automation and informatics. And they weren't looking at them from the point of view of what was the degree of overlap and the differences and the emphasis, and why was this different from that one. But we, of course, had studied this ad nauseum in order to build the Metathesaurus.

When HIPAA [Health Insurance Portability and Accountability Act] was passed in 1996 and the transactions and code sets part of it, which was focused on really electronic interchange of billing data and standards for the same, then part of this was going to be, okay, what were the standards that were going to be recommended? What was going to be required for these electronic transactions?

By that time, partly because of being involved with Don Detmer and the IOM study— *The Computer-Based Patient Record*—partly because of a trans-HHS [Department of Health and Human Services] activity that Roz Lasker [deputy assistant secretary for health policy development] initiated about data, and the fact that NIH ended up naming me to be the NIH representative to Roz's committee—it had to do with stuff related to NLM and UMLS and the health services; I was on this committee [Public Health Service Health Data Policy Coordinating Committee]. As a result of this, I had a lot of contacts across the department, and I worked with Roz and Phil Lee [assistant secretary for health]. We had that High Performance Computing and Communications program [editor's note: Lindberg served as founding director of the White House HPCC program, 1992-1995], we had people being connected to the Internet, and they were really focused on public health and public health departments. And they were saying, they're being left behind; there's all this activity. What could NLM do to bring these people into the fold?

B: So is this when public health got involved and the National Information Center for Health Services Research and [Health Care] Technology became part of it?

H: Yes, exactly, because our funding was there, and we wanted to do things and we wanted to expand in public health, and that was where we had a little bit of leverage.

B: So it wasn't part of the original vision.

H: It wasn't *not* part of it. And the other thing was that, fortunately, Alice Hersh, and the Association for Health Services Research under her direction, had a very broad focus that

included things like public health systems research. Not just what's the best way to deliver services and how can we see which is the most cost-effective way to deliver personal services, but also the issue of how does the public health system operate, and that's part of the health services research mission and how were we doing with that. She had a very broad view of it. So it was not any kind of a problem. If you would go down there to these meetings when she was running them, there would be people there presenting on public health issues, and Robert Wood Johnson [Foundation], which provided some support for that organization in various ways, would have fellows, and some of them would be public health and some would be others. It was fine. It fit there and it gave us the opportunity.

Because [Phil Lee and Roz Lasker] had come and said, "What can you do about this?" that's when I worked with Roz and Bill Braithwaite [senior advisor on health information policy], who was down at the department [HHS] at the time, and with people at CDC [Centers for Disease Control and Prevention] and at AHRQ [editor's note: AHCPR was reauthorized as AHRQ (Agency for Healthcare Research and Quality) in 1999], to come up with that meeting that we held on the day of the Oklahoma City bombing. I think it was 1995. [Editor's note: "Making a Powerful Connection: The Health of the Public and the National Information Infrastructure," a conference sponsored by the Public Health Service at the National Library of Medicine, occurred on April 19, 1995, the day of the Oklahoma City bombing; a small group also participated in a strategy session on April 20.]

B: Was this the beginning of the Public Health Partners [Partners in Information Access for the Public Health Workforce]?

H: That's right, that meeting came out of here. We were also trying to bring the informatics and public health communities together at that meeting. As a result of this, I had all these contacts, and people knew some of the things about the UMLS activities we had that gave us a level of expertise.

Then HIPAA was passed and they had to come up with rulemaking for the standards, and part of the issue was what were going to be the coding and classification systems that would be required for use in these administrative-type things. Roz Lasker and Bill Braithwaite were point persons to set up the in-house HHS teams that were going to have to work with the National Committee on Vital and Health Statistics and shepherd this whole thing forward. They felt it was really important to have somebody from NLM— me—co-chair the group that was in charge of the team, in terms of in-house expertise working on the rulemaking for the codes and classification piece and making selections. Clearly, the National Center for Health Statistics, which was responsible for the clinical modification of ICD [International Classification of Diseases], was a very important player, so there was going to be somebody from there. Then we had what was still HCFA [Health Care Financing Administration], which was responsible for the procedure coding part of ICD as it was at the time, plus they had the arrangements with [the American Medical Association (AMA) for] CPT [Current Procedural Terminology]. They were the ones that had the billing data and who wrote the rules for the Medicaid and

Medicare population. So they had to be involved, because obviously you didn't want an outcome that derailed many existing programs, and they were knowledgeable. But down at HHS, Roz and Bill Braithwaite felt that the whole process would have more credibility if there was somebody involved who was a neutral party—that is, somebody who was not actually developing one of the systems that was required for use and that may be designated for use, someone who really didn't have their own dog in the fight. So that became me.

It was rather interesting, because the CMS [Centers for Medicare & Medicaid]—HCFA at the time—had so many pressures, because to add a code meant there was a new procedure that a hospital could bill for—huge economic consequences. If CPT could be extended in a certain way, HCFA would agree to pay for that... They're like FDA [Food and Drug Administration]. There was a lot of pressure on this issue about what could and could not be a code. On the other side, if you acknowledged that secondhand smoke was an etiology for a disease, this opened up all kinds of potential responsibility for covering this, for what kinds of things would be considered conditions that would be covered under Medicare or Medicaid, and who was responsible. So they really had a whole kettle of fish over there, which was difficult. They really weren't in the same position that NLM was to inject this issue about, well, is this usable in an automated system, how is it maintained, how is it updated, and what have you.

I had had some influence over the actual wording about the code sets in the [HIPAA] law that was passed, in terms of what would be HHS's responsibilities and when could they develop a new system or not, so the wording in there that required that the system be available in electronic form, maintained, and available at—it might have said, at low cost—was actually the language I fed to Bill, who was involved in working with the committees to get the law passed.

That put me in this health data standardization stuff big-time. When they asked me to do it, I talked to Don about it, and I said, "Don, I would really rather not work on this. It's going to be a lot of work. But I feel like if we're going to get support down the line—HHS-wide—for standardization of clinical data, which we do care about, then we've got to be perceived as part of the team that helped solve their problem too." We couldn't have them do this and then fly in in the end and say, "Hey, we'd rather have this." If we're there in the room all the time, we can keep pushing in that direction, but in the meantime, we're carrying water for them. And we did. Vivian [Auld] and I carried a lot of water for them in that. And that's when I got my first experience with rulemaking. It was actually a friendlier experience in many ways than the thing with ClinicalTrials.gov.

So it was really starting in the late '80s, early '90s, where I was building up through all of these different connections—the creation of NICHSR, the fact that Roz Lasker was down at the department, and they had approached NLM about this whole notion of, can we get public health in there [connected to the Internet]. She already knew me, and Phil Lee had had another one of these National Center for Health Services Research centers at UCSF [University of California, San Francisco], and he was in charge of it, so he and Don went

back a long way. The whole notion of, can we bring these people electronic records... This all kind of reinforced each other.

It obviously was also a very big learning experience for me. I was learning more about this stuff all the time. And I got a huge number of contacts in various groups—in health IT, in informatics research, in policy, as a result of being in all of this.

B: Can you continue this story, especially with regard to the SNOMED [Systematized Nomenclature of Medicine] vocabulary and how that came to be licensed by NLM for the U.S. through HHS, and the founding of the IHTSDO [International Health Terminology Standards Development Organisation]?

H: Yes. So here's what happened. Part of what I was doing was learning what it is that was really the problem with moving ahead standardization of electronic health data, and what, of all of the major problems there were, was an appropriate place for NLM to have a positive impact.

Many people thought that the goal of the UMLS, before they understood it, was to create the standard clinical vocabulary—and then that one would become the great one, much better than any of the existing ones, and then that would move ahead. And of course, this was not our plan at all. When we studied the whole thing, and I talked to Don and we all thought about this, the notion that we would do better than SNOMED or the Read Codes—both of them very large systems—it was like overweening conceit. The people who had been working on these things over the years and had these grand ideas about how to do it, these were not fools. Maybe you could look at what they did and could say, well, we could do it better, but do you know? In the meantime, SNOMED, at least, had been evaluated by all of these groups within the United States, and they thought it was the best thing. In the meantime, we had the Read Codes over here, which was in use. And then, when the College of American Pathologists and the NHS [National Health Service] decided they were going to merge the things…

B: The Read Codes and the SNOMED? Okay.

H: And that became SNOMED Clinical Terms [or SNOMED CT], because it was originally the Read Codes, and then it became NHS Clinical Terms, so that's what it was called when it was merged.

The first thing I did, other than strategizing with plans and obviously working on the HIPAA and supporting the National Committee on Vital and Health Statistics, which had a requirement to produce by 2000 a set of recommendations for the [HHS] secretary and the Congress about what the federal government should do to advance patient medical record information…. They had an explicit mandate to produce a report by 2000 to make recommendations about what the U.S. should do to advance this, which was a fabulous thing. [Editor's note: The recommendations in "Uniform Data Standards for Patient Medical Record Information" were submitted in July 2000.] That was a nice, big toehold. So, naturally, from 1996 on, that was one of the things I worked on—with the

committee's structure so that I could be one of those who influenced what was in that report. Vivian and I both worked for that committee as well.

But before HIPAA, in a year or so lead-up to it, I said, what could we do that would be useful that would advance what we know about this problem and would be something that would be reasonable for NLM to do as an extension of what it's already doing through UMLS. That's when I came up with the idea of the [NLM/AHCPR] Large Scale Vocabulary Test. The notion that we could set up a national test environment where we could find out how much of the terminology that people were using in EHR [electronic health record] systems now, in their problem list or wherever they were using it, was actually concepts that were covered by the standard terminologies that were out there; and could we design an experiment that would allow this to be tested in a reasonable way involving a lot of people around the country.

One of the things that the public health activity did was to say, well, let's include public health departments in that activity as well—which, in the end, we got very little participation from them, because they just weren't far enough along to do it. Well, this is when the collaboration with Alexa [McCray] was fabulous, because we came up with the notion that we had to have a platform where everyone was taking their terminology and using the same interface to determine whether that concept or terminology was already in the set of standard vocabularies or not.

B: And this is Alexa McCray in… the Lister Hill Center at the time.

H: … She had developed the web-based terminology server already for the UMLS. The issue here was, you can't have everyone designing their own interface and their own set of indices to determine whether this term is in the UMLS. You can't do this. Maybe theirs could be better, but you need everybody who's doing this experiment to use the same one. Then you add on top of their answers—you put a group of people together who are more expert in the systems, and they do a random sample of the things that were not found, and a random sample of the things that were—did everybody pretty much do a good job. We put together a group to do that after everybody was using this system, and of course, this was the issue, because Alexa and her team had put together the normalization routines. So what did we do? You put in your term and it runs through the normalization routine to get the stem, and then it matches that to the indices we've created, which were also created using the same normalization techniques. If your term is there, it's going to find it, because we're applying the same thing here and the same thing there. Now, it might not mean the same thing; you're going to still have to review it and decide whether it really is the right one.

This thing was brilliantly successful due to this wonderful infrastructure that Alexa and her group put together. And May Cheh was the manager of all the people who were using it and helping them. So that was great.

We got a huge involvement in this thing. There were like 40,000 data points from N number of groups across the country. We dealt with a statistician in terms of how we can

analyze this and what we can say, and she said, "With this number of data points, everything you find out is statistically significant. Now, some of it may be useless, but it's all statistically significant because you have 40,000 data points, which you normally don't."

What this did was allow us to say, look, folks, most of the content that's needed is already there. The two biggest sources of this content are SNOMED and the NHS Clinical Terms. Interesting, although they're both very large and obviously have considerable overlap, they have great strengths in different areas. There is a lot more of this kind of terminology in the NHS thing; there are a lot more of these kinds of terminology in SNOMED. So there were a lot of political reasons why the two of them should get together.

We were able to show these data to them, so that was supportive of a direction that eventually they both wanted to go—to say, look, there's this sense here that you're not a total overlap. If you get together, you're going to have a much broader coverage. So I figured that running that test was something, and if we couldn't do anything else but that, then we would know more about what we were dealing with than we did before. And if the answer wasn't very good, okay, we'd still know more. If the answer was good, that would be great. We could move ahead. So that was one thing I did. The test was run in 1995-96, and the results were reported out in 1997, so that was very early after HIPAA.

That was another reinforcing thing—that we knew stuff about this. I had become convinced, like so many other people, that if you didn't provide some level of stable, up-front support for the maintenance of a clinical terminology or a coding system, it was never going to go anywhere, because it was never going to fly that everybody you wanted to use it would actually go through the agony of licensing and paying for it. And if there ever is a thing that needs a network effect, it's this. One guy doing it doesn't get you interoperable health care data.

So my whole goal was to figure out how we get somebody to take responsibility and will it be in anyone's mission to just provide some level of support for these terminologies. Then, this wonderful thing happened: We were entering the timing of the doubling of the NIH budget, and Don said, "We're not just going to do everything the same the way we did before or make it bigger and better; we've got to do some new things. Our budget is doubling."

Of course, that supported consumer health and it supported ClinicalTrials.gov and it supported PubMed Central. And, of course, it enabled us to keep up for a while without passing the hat to NIH with the flood of genomic information. But the other thing it did was give us some money to play with in the standards area. Because I knew this 2000 report was coming, I figured that we needed to have an example on the ground where we're doing this already. We need to have a justification for it and we need to do it so that this report can say, this looks like a promising approach. Maybe that's what the government should do.

That's when I worked on getting the agreement for us to provide support to LOINC [Logical Observation Identifiers Names and Codes, terminology for laboratory test orders and results produced by the Regenstrief Institute]. This was a much easier case, because they were giving it away. They just wanted support so they could continue to do it and maintain it in a good way, and, because in that little period, it was designated to be a HIPAA code set. The justification for the U.S. to provide partial support for it could be linked to the fact that it was going to be mandatory for use under HIPAA—which never happened. Maybe it's happened today. But that particular thing was going to be mandatory to identify the different claims attachments. It was going to be like a document identifier: This is the discharge summary, these are the clinical documents that you might ask for in order to adjudicate a health insurance claim. But the claims attachment standard rule was the one that got hung up, and maybe it's been published now, but it didn't happen then.

However, we set this up, and lo and behold, in the 2000 report, it was there. This is a good model and we should do this. And all of the people involved knew. And part of this was, we wanted to send a signal to the CAP [College of American Pathologists], this is a model; think of this one. Because they were getting no place, and they were causing a lot of problems. It was too difficult to enter into a license agreement. It was one of these things like we had with the Big Deals—everyone was sworn to secrecy, so you couldn't come up with a general strategy.

The VA [Veterans Affairs], the CDC, and NCI [National Cancer Institute] came to me when I finally had concluded the deal that allowed us to put the CPT in the UMLS—this was a five-year effort. I finally had concluded it, and of course, then we were just saying, hey, it's a totally restricted source. It's here. You can see it; you can evaluate it. If you're going to use this thing, you need a license from the AMA. Why was this [using UMLS] not easier...?

Originally the AMA had supported the UMLS project. We had a meeting in the very early days of the UMLS. We met at the AMA headquarters to describe what we wanted to do and to convince other professional societies that it was a great idea, and there was somebody from the AMA standing up saying, we really support this. So the whole thing was kind of crazy.

But having concluded this side deal with the CPT, well, Betsy can negotiate anything. So they came to me and said, "Would you negotiate a federal-wide license for SNOMED?" and I said, "No, but if you want to go for a U.S.-wide license, I'll try." Because I just felt, federal? Why? This will be a mess. Where do CDC's data come from? If, on this day, the DOD [Department of Defense] has an agreement or a contract with this particular health system to provide services for dependents in upstate whatever, and then they don't like that, so next year they go to another one—what is this health system going to do, yank SNOMED out? This was unworkable. And you can imagine that if anyone is serving as an agent and I have a contract with Cerner. He's got to have access to this. What is he going to do if I break the contract? Take it out? But I was willing to try for U.S.-wide. We posted an intent to negotiate sole source on this thing, and was anybody

else interested, and would they come in and say so, and they didn't at that time, although it came up later with one of the things. We issued an RFP in 2000.

I'll tell you the timing on all this. They were all talking to me about doing this, and I had gotten the strategy together and I was working on the report and all of this, and I was sort of committed to doing it before Lois Ann retired. And there were some other things. I didn't know that she was going to retire any sooner than anyone else knew. She was a very private person about a lot of things.

B: Which was 1999 that she retired?

H: I became associate director in 1999, and she left in 1998. But these things were already in the works. Afterward I thought to myself, if had I known this, would I have persisted. But I did.

Essentially, our problem in the length of the negotiation was the price, and there was too big a disparity. After we'd been at it for about three years, they [College of American Pathologists], in essence, wrote a letter to me—and to Mary Smith who was in the contracts office—wrote a letter to us saying, "We've been at this for a long time and we really need something in this thing [a certain annual fee], and if that's not possible, we probably should stop wasting each other's time." It wasn't quite worded that way. And [the fee] was just totally off... It was not what we could agree to. So we sent a letter back signed by both of us saying, "Then I guess we'll have to give it up and we'll have to stop this." We appreciated all the time and effort they had put in and were sorry we weren't able to reach agreement and thank you very much, which apparently astonished them.

It was very surprising to me that from the very beginning of this long negotiation, they thought I was playing a game with them. They didn't think that the information I was giving them, which was solid, like, no, we really can't do this... I would provide comparable numbers. I would say, "The annual cost of building MEDLINE is less. We just can't go here"—or PubMed or whatever it was I was talking about at the time. "And we've looked at this from the point of view of what it costs for the development of MeSH and the UMLS, and we've asked other people, and we think…"

They thought it was a bargaining technique; they didn't think that I was just saying it the way it was. And it always surprised me, because they had interactions with a lot of people who knew me and had known me for a long time. I literally didn't think that if they'd had a serious conversation with any of these people about what I had said and whether that was likely to be the real position, I didn't think there was probably anybody who knew this topic and knew me who wouldn't say, "With Betsy, what you see is what you get" kind of thing.

But, for whatever reason, it came as a big surprise to them. Fortunately, it was a real problem to them if they didn't make this deal, and of course people were telling them this. The HHS was telling them. So were the Kaiser people, who apparently went to

them and said, "This is a disaster. You're not going anywhere with this and everybody has been waiting for this deal to be made, and you've got to make it."

They, then, contacted John Porter, who was by that time a former congressman and had been head of our appropriations subcommittee. NLM had had a lot of interaction with him and he was favorably disposed to NIH, but NLM as well. He was working for a firm that supported [CAP] in the Capitol now, so he called Don and said that it seemed a shame for this to [fail]... were we willing to reopen the conversation. And, of course, Don just said, "Sure, we'll talk to anybody."

We had a meeting, and I had a much better command of the whole thing and all the issues than they did. That was when I was really surprised, because the only person who was in every meeting about the negotiation of this deal was me. They didn't organize it so that they always had at least one person who knew the whole history and all the stuff going forward. I think it was not a very good approach to it. I think they were convinced that they could get something much closer to what they wanted. I think they were making assumptions about some of the people who were in some of the meetings—that these people just weren't effective, so let's have someone else. It wasn't that; it was that they were not correctly reading that if that's what they needed and wanted, they could have said, "Well, thanks for opening this, but so long, goodbye, and good luck" way earlier.

It was good it was reopened. Don King, also very connected to the pathologists and not the top director of NLM [he was deputy director for research and education], was very helpful in some of the negotiations on price and calibrating what was possible. I was very grateful to him and to Don [Lindberg], obviously, because I think I might have snatched defeat from the jaws of victory there. But they were very surprised. I think it turned out to be part of the winning strategy to say, "No, if this is what you need, we can't give it to you. We're too far apart on the price."

[Editor's note: The HHS secretary announced on July 1, 2003, an agreement with the College of American Pathologists making SNOMED CT available to U.S. users at no cost through NLM's UMLS. Funding for the one-time payment for the perpetual license was provided by HHS, DOD, and VA, with NLM paying the annual fee for updated versions.]

But once it was done—and I've recently been commenting on this very thing in the IHTSDO giving my comments in response to getting all the awards—once it was done, a number of people in other countries began to look at it as a reasonable part of a model: an international organization that could own SNOMED and move it forward in a good way and in a way that would be more acceptable to governments around the world.

Again, real leadership in the U.K., but also in Canada and Australia. The U.K. already had an NHS-wide license for the use of SNOMED. That was quid pro quo for them helping to build the outcome of the effort of the merger—NHS Clinical Terms and SNOMED—which was going to be something that would be usable by the NHS, and they more than had contributed enough in terms of effort to make that absolutely rational.

But in my opinion, they hadn't negotiated the best deal, because the NHS is not contiguous with everybody in the U.K. who needs access and who could make use of the standard. By the time we negotiated our deal, they had been on the phone with me because they were going to do some renegotiations with the CAP, and they wanted to know more, as we were working on it, as to what was the scope of our deal. This was before we concluded it. But what we were including, they had a real problem over there, because they hadn't included the universities. The U.K. has a number of very distinguished, productive, and useful health informatics researchers, and they didn't have access. That was going to have to be another negotiation. So that wasn't good right off the bat.

People looked and said, "Well, okay, that's the U.S. price. We can look at some formula, and so then the Canadian price should be X, the Australian price should be Y. They went in to negotiate with the CAP on that basis. I don't know whether they got exactly that, but that was their negotiating approach. And of course, I always thought that if the CAP had been serious about wanting this to be international and to get the licensing fees themselves, they could have, the day after they made the deal with us, published the price list for everybody, but they didn't do it.

In the meantime, the U.K. was convincing them that really the only way forward to international adoption was to get this thing out of the ownership of a private organization in the United States, that this was just not going to be acceptable. And, of course, at the time they were selling this, the U.S. and the U.K. were not the most popular kids on the block. Do I see anything similar to today? Because of the invasion of Iraq.

Then Martin Severs, aided and abetted by other people—chiefly by some good people in his own country, but also in Canada and Australia—were the ones who started pushing this forward. Of course, the CAP had to agree to it or it never would have happened. That was great that they did. And then Martin and the CAP went around the world, really, to various places, convincing people that maybe this was a good thing. They had six countries, including the U.S., lined up.

Before they came to meet with me with the details, they had Richard Granger, who was in charge of health IT strategy for the NHS at that time, with Martin Severs as sort of his chief medical person working with him, come to meet with David Brailer [appointed national coordinator for health information technology by the Bush administration in 2004] to sell this notion of the international ownership of this and how this could move things forward for all countries, and increase the marketplace for products that incorporated SNOMED in a good way and potentially increase the users. So it would be all good. They got in touch with David Brailer, and David called me and said, "I'm not meeting with anyone about SNOMED CT unless you're in the room." So I was down at the department with this initial strategy where they're talking about this, and what they were trying to do was to say, now that you have this thing, they wanted to increase the amount the U.S. would pay. And David was not having any of this. And, of course, I wasn't having any of it, because if it was coming out of NLM's budget, I didn't want it to come out of that.

There was that organizational meeting. But then they really got going with it. They were going to go around and look. Both Kevin Donnelly, who worked for CAP, and Martin came to meet with me. They laid this out and said, "Will the U.S. join if we are successful with this?" And I said, "Three conditions. We don't pay more, we don't get less, and you form this organization in a way that is legal for the NLM to join."

When I was getting ready to go to this meeting [of the IHTSDO in October 2017], I found I had a CD of the background documents for the first meeting of the potential charter members in, I think, it was June of 2006. So these other meetings had taken place earlier. But there we were, and there were only six countries there then. By the time it was actually formed in the spring of 2007, there were nine.

B: And today there are...?

H: Thirty, and very likely to be at least three or four more joining in 2018, and maybe more than that.

What our license did was sort of say, okay, this could be done. We did some of the heavy lifting for them because they took a lot of the provisions of the licensees straight out of what we wrote, which they had to do because we couldn't get less. But that helped them. We had spent a lot of time on defining what was the U.S., and that was very valuable to them. What was not so helpful to them was that we had set the maximum price that the U.S. would pay. They really wanted to form the organization with a budget of about $10 million, and they only were successful in forming it with a budget of about $9 million because our thing was fixed. They couldn't go beyond what we had agreed to with the CAP.

It was quite a feat to get this thing organized. Everyone did a tremendous amount of work. Martin Severs—a force of nature, irresistible that he was going to make this happen—if he didn't have this kind of driving activity to it, there were just a thousand ways it could have gotten derailed.

And the people here at NIH and NLM were fantastic. Dale Berkeley [NIH counsel] was the one who had to review the articles of association, or the bylaws of the association, and advise on what had to be different in order for us to do it. There were whole sections of it that had to be written in so we could pay with a contract, because that was the only way we could pay. Phil Osborne and the people in [the NLM Office of] Acquisition, the people who worked with us on setting it up originally—really fantastic. If we had been in another environment where people's normal reactions were, "No, I've never seen this before, you can't do it," we could have been in a world of hurt. So it was great.

The issue was, there were a number of people who wanted to move forward with the use of something like SNOMED, but they were afraid that if they did, then the U.S. would pick something else down the line and they would have wasted all their time and effort. So they wanted it to be required by the U.S. first. But, of course, the thing wasn't ready

to be required for any particular purpose, and what was necessary was to focus effort and feedback on the improvement of one or a few related things—SNOMED, LOINC, RxNorm—so that they would be ready. By the time we required the use of it, it wouldn't be a crazy act to require it. It still was pretty crazy, but not as crazy as it would have been if there weren't this lead time.

So there was that. Then there was, well, no one's demanding that I use this; no one's demanding this, none of our customers. If you were any EHR developer, no one is asking for this. It takes time and effort to do it, and they want something else, so we're not going to deal with this. Even the people who did want it would say, well, "I'm trying to get my vendor to do it, but they won't do it, because they don't think there's any market for it." It was all like everybody was staring.

As I commented at this thing in Bratislava [editor's note: Humphreys was awarded the SNOMED International Award of Excellence and Lifetime Achievement Award at the SNOMED CT Expo 2017 in Bratislava, Slovak Republic], this was a brilliant model, because it had the potential to address all these issues. It got everybody out of the negotiating game in the countries. There it was. They had access to it. They had to sign a license, but there was no negotiation, and there wasn't this fear about, okay, they'll get me for this price but what about next year? Will I be able to afford it? So that was great.

The real positive thing was that we wouldn't sit around and have possibly the Canadians putting their feedback into this one, while the U.S. was putting it into this one and the U.K. into that one, and New Zealand was doing something else. At least everybody is trying to use the same thing, so you hope that you get it improved faster and you also get a better understanding of what's really needed, and a wealth of things. So that was great.

And then, it gave the governments a way to endorse it without requiring it. If the government of X is willing to be a member of this organization and pay a fee each year so that it's readily available to anyone in their country, three years from now, when they're ready to require it for the XYZ reporting, are they going to pick something else? It provided that certainty that we're getting there.

So it was a brilliant model. It really addressed a lot of this circular, it's everybody's fault, and I can't move forward, in a very good way. But every brilliant idea doesn't get implemented, and every organization that gets formed that has a great goal and high hopes doesn't last. So you really have to give credit to a huge number of people around the world, because they made this organization, and ten years later it's going strong. This is not an accident. This was not inevitable.

There is no doubt that even though SNOMED doesn't solve all problems and never will, and you're still faced with the enormous difficulties of EHRs and how you're going to use them, the fact that this organization existed, that SNOMED had stable support, it was being regularly maintained, it was available for use without strings in large parts of the globe and those parts were getting more all the time, this has really had quite a big impact on health data policy in a number of countries and also on the development of health

information systems. It's only a little piece, but it was a real crack in the wall that seemed to be preventing forward motion in a lot of areas.

B: Sounds like it meets some of the principles that you said Don Lindberg talked about, where you try one thing, iterate it, see how it's working, and then go from there.

H: Yes. And the organization has really been good. Vivian [Auld] has played a big role in this in the last few years. It's not all smooth sailing. With something big like this, the progress is never as fast or as smooth as you'd like. And what we're talking about here is making a difference in an area that will not change until we have human behavior change on a broad scale.   So this is not an easy proposition. But the organization stuck with it and they made some hard decisions and they upset some people, in order to see if they could continue to make it work.

It's not the same, but it kind of reminds me about all the medical librarians back in the day who were really upset and angry with the way our grant program was implemented, and it didn't meet their needs. But they supported it. They fought for it, the reauthorization of it, because they felt that in the end it was good for them, even though they were very irritated with this, that, or the other thing. The same when they were upset and angry with us about end-user searching and Don Lindberg and having a very negative view of some of the activities that he pursued. That didn't mean that they weren't always up there on the Hill supporting NLM, because they knew it was good.

I think a lot of people in this group didn't take their marbles and go home, and they all deserve a great deal of credit for that. The first time I met with Martin about it I said, "Hmm, I guess this could be a really good thing for the world, but I'm really skeptical that he's going to be able to get countries to agree to this. This is going to be quite a bit." Well, after I knew him better, I knew he was going to succeed, because the man is irresistible once he gets something. It's going to happen. And then I began to do what Vivian and I both were saying—"Ahh, this is going to be a big responsibility. This is going to be a lot of work." Of course, not just for me, more for all the NLM people [laughter] who have had to contribute to this ever since.

B: But a really important contribution.

H: Well, as I said also, the best thing I ever did for that organization was line up all these fabulous NLM people to do work for them.

[MP3 File #4]

B: Next I'd like to ask if you could share with us what were some of your biggest challenges and accomplishments in Library Operations, and as the associate and deputy director here at NLM.

H: The biggest challenge always relates to people, and what is the best way to support them in their jobs, provide both positive and critical feedback when it's needed, and help

them grow and do the best they can. And I feel that my performance in that area is very mixed. I feel that often, perhaps, I did not spend enough of my time thinking about that and working with it, as opposed to thinking about more the objectives and what needed to get done, and what might be done if we could just think of a good way to do it. I don't put myself as the worst on the face of the earth, but I feel—and maybe we're all like this or maybe we're not—but there are some people I feel I didn't really help in terms of their development as much as I could have.

I am very good at, or generally pretty good at, putting myself in another person's position. I am very cognizant of being sure that people had the right support and the right training before I come down on them for not doing a good job or for causing an issue or a problem.

I know that I have a lot of production-line type of experience myself in my early career, and I know you can't snap your fingers and do something instantaneously, so I have a high tolerance for, "Are we headed in the right direction? Is progress being made? Are problems being solved?" Except in those unusual circumstances where the National Library of Medicine had a hard deadline and there was no way to move it, I like progress and moving things ahead, and I'm not very likely to be upset if the first schedule we laid out is not the one in which it's possible to do a good job and get the thing done.

Thinking about that and doing the best you can for each person, helping them along, and understanding that I understand all these things, as I say, I don't know that I've always been very successful in figuring out what would be the key or thing that could really help people who might be struggling.

B: I can relate to that. So with the retirement of Dr. Lindberg, NIH appointed you as acting NLM director. Can you talk about what were your goals and accomplishments as acting director?

[Editor's note: Humphreys served as acting director April 2015-August 2016.]

H: What I thought was a very important priority was that NLM would provide the best type of information and support and input to the [NLM] Working Group of the [NIH] Advisory Committee to the Director that was reviewing NLM's mission and was going to provide advice to Dr. Collins [NIH director] about that. I was very concerned that they would get a broad picture of NLM's current programs and the impacts we had in a variety of different areas, and that our people who rely on us would be responsive when asked to provide input on short notice to them. I thought that was a very high priority for me. So as we were putting materials together, I was trying to look at those materials from the perspective that I thought some of the members of that group would have and that Dr. Collins might have, and trying to be sure that we were doing the best, that at least I knew how to do, to present the information to them in a way that they would not have a narrow or skewed or uninformed view of what the library was doing. That actually occupied a fair amount of my time, particularly at the time I first became acting director. [Editor's note: The Working Group's final report was submitted in June 2015.]

And I also felt that it was important to do the best I could to get resources and so forth for us during that time. I felt that the situation that I was handed in terms of personnel was very difficult, and more difficult than it seemed to me it needed to be, in order to meet the objectives of providing flexibility for the next person coming in.

I was not given the opportunity to provide input to the selection [of the NLM director]—I don't even mean input to the selection, but just information about the candidates. I actually feel that that would not have been an approach that I would followed myself. No one had to take my advice, but they weren't considering people—in almost every case, there was nobody on the final list—there might have been one—that was not a person I had worked with and known, and knew their strengths and weaknesses for a long period of time. So I just found the process interesting, because it seemed to me that they were shutting themselves off from a source of knowledge about these people, and I didn't understand why they needed to do that. I wasn't a candidate myself. I wasn't going to make the selection. So that didn't make a lot of sense to me.

There were certain things that we needed to move ahead with, and I wanted to make sure that they did move ahead. I didn't have to do a whole lot to make them, other than to do it. A big one was the change in the network structure, which, I did make the total decision that I was going to act like this was going to happen, and it had nothing to do with any review of NLM that was going to take place. I think it's conceivable I could have handled that a different way and someone would have thought it was theirs to second-guess, and I didn't do it, so I thought that was the right call [laughter]. Maybe it would have been fine anyway. And, of course, people handled it very well. [Editor's note: For the 2016-2021 award period, the funding for the National Network of Libraries of Medicine (NNLM) reverted to a grant mechanism, specifically a cooperative agreement, from the contracts previously awarded.]

There were a bunch of things that related to public access and the [NIH] Public Access Policy and changes that people wanted to put in place, and I wanted that to move ahead. Then we had the clinical trial stuff, which I really did not play a key role in other than occasionally smoothing a path here or whatever—not so much as I had done before I became acting, because there just wasn't any time for me to do that. Helping the folks who *were* working on it, running interference for them, working closely or trying to complement what David Lipman was doing to move that ahead, and he was doing a fine job.

Then, when I knew that Patti [Brennan] was the candidate, I wanted to be as helpful to her as possible and give her as much background on different things before she came, while I was still acting, lining stuff up about where some of the rocks were and filling her in on some of the things that had been problematic in terms of NLM during the interim and giving her background and so forth on that. I wanted to do that. I didn't have much expectation that NLM wouldn't run pretty well, because there is a great team of people.

I did continue to serve on both the [NIH] Scientific Data Council and the Administrative Data Council, and I can say that I did my best on BD2K [Big Data to Knowledge]. I don't feel that I had a huge positive impact. I thought that pushing ahead with even that very preliminary study about how many data sets do we have was sort of taking me back to my original time at NLM with what is N, what are we talking about here. I do feel that that was a real contribution, because at least now we could say what N was. Even though we would be 50% off, we would know more than what we knew before. I was pushing that and I was trying to figure out what we could do in that area. But that was a very big disappointment to me in the sense that I think we had a number of people at NLM who were knowledgeable and were trying to be helpful in a variety of areas, and I would put Mike Huerta and David Lipman and Jim Ostell and me and Jerry [Sheehan] and Valerie [Florance], and there may be more that I'm forgetting in this category. We made a little bit of positive difference around the edges, but I felt that a number of the strategies that NIH elected to follow were not those most likely to achieve a beneficial result and they got pursued anyway.

B: And that area is still evolving.

H: I would have been glad to be proven wrong, but so far... So that occupied time, although there was a point where I just really couldn't spend time on it; I could just encourage Mike and Valerie to spend as much as time as they could, so that there would be background knowledge that could be passed on to the new director of NLM, because somebody was in the room when all this strange stuff was going down.

There were some very good things that happened on my watch, but they might have happened anyway. Certainly, expansion of PubMed Central—I always have been a big supporter of that. If there were some things I could do to help that along, I did them. It was the only sensible approach, but still, it was a great thing that other agencies decided to use PubMed Central for [archiving their government-sponsored research for public access], and our folks came up with some refined approaches and have done a good job in terms of juggling the people to do stuff so that it has moved forward in a very, very good way.

In the early years of PubMed Central, I ran interference. One of the things that I think is good about the way I've behaved throughout my career is that I always felt that I was working for the National Library of Medicine [as a whole], and I always viewed it that way. I was extremely proud to be in Library Operations; I had nothing to apologize for. I thought these were wonderful people. But I always felt that I was working for the National Library of Medicine.

The thing that never intrigued me was when people within Library Operations or other areas would be more concerned about whether their group was in charge—or whether they had been this, that, or the other thing—other than were they [working for] progress for the services and programs at the National Library of Medicine. It was very difficult for people in the early days of PubMed Central, because there were some people who

were very, very concerned about digital preservation writ large—very—and they didn't feel that PubMed Central was a solution to the whole problem. Absolutely true.

But I did on many occasions have to remind people that PubMed Central was a huge, beneficial effort. It was the best that NLM could do in this area. If we did nothing else, it would be a huge contribution. And we certainly did not want to, by other things we were doing or saying, send some sort of mixed signal that somehow there was a group at NLM that didn't think PubMed Central was all that great, or that PubMed Central wasn't such an important thing. I held people back from doing things they wanted to do, because I just felt there was a possibility for really a bad outcome, where we would somehow be pointing out that PubMed Central had these flaws. Then at a time when it had a lot of enemies, they would capitalize on that. I was absolutely certain, that on my watch, no one in Library Operations was going to be handing a club to anybody who was against PubMed Central to beat it over the head. I thought that that would be a giant disservice to the country and to the world [laughter].

Although the points people were raising—it wasn't that there was no point to it. They were raising things that were important. But sometimes in some of these areas over time—and I've done it in other areas where I probably couldn't pull them out of the hat—[you] say, yes, that's important, but right now, this is more important, and we've got to be real sure we don't do anything to derail this, because it has the greatest potential impact. We don't want to be looking back and saying, oh, if only we hadn't done that, maybe it would have gone further, faster.

B: And here we are, 4.5 million articles later.

H: Yes.

B: Wonderful. So we're going to talk a little bit about about your involvement with MLA in a minute, but I think a good bridge to that would be to talk for a second about the National Network of Libraries of Medicine, which you mentioned, because that is the program I heard you say before that really connects us to one of our key user bases.

H: Well, you know, it's interesting. I had my greatest involvement with the network at the beginning of my career, because I was interacting with all of them around SERLINE—which was less popular—and then building the National [Biomedical] Serials Holdings Database [SERHOLD]—where I was the front of that activity and selling it and getting everybody on board—even though Dianne [McCutcheon] and Martha [Fishel] did a lot of the work afterward to put it together. But in terms of selling it and getting buy-in from Dr. Cummings, which was not...

There was a real question as to whether it was worthwhile to include hospital library holdings in that. I thought it was extremely worthwhile to include them, that they would not expand the universe of titles that we had to deal with—probably, in any way, shape, or form, that their number of records was going to be relatively small in comparison to it—but that the ability for them to know what each other had and have automated support

for their free sharing arrangements, and also to be sure that people were getting it from the closest place.

B: Because everything had to be mailed.

H: Yes, or you could go down and pick it up. Why would you want a doctor to go to the University of Nebraska when there might be a hospital library down the street from them where he had the opportunity to go down and pick it up? You didn't want this. And people wouldn't have done that. They would've known it was a bad service, which means they'd be working around it. It wouldn't be what it was supposed to be, which is, you could put the request in and it would take care of it for you.

I was involved in making that point, and I was very glad, and, of course, the hospital librarians were very glad too. And once we had it, they proved the point they already had—they were really a big, important thing in the ILL [interlibrary loan] network. There were larger resource libraries that were getting many more requests, but, once you had the numbers, you could prove that these smaller collections were really having a major impact on rapid delivery of material that people needed. So that was good. I was heavily involved at the beginning and I was positively viewed.

The next thing I was involved with was the [MLA] Medical Informatics Section. Because of the orientation of the UMLS, I was saying to the medical informatics people, you should have joint programming with the Hospital Libraries group. We had some interesting things where we brought in the informatics people, and I was involved in helping set that up. I was also involved in the early 1990s with the hospital satellite broadcast, which was seen as very positive by a lot of MLA members on the hospital side. I don't know if you remember this thing.

B: No, tell me more. What was the hospital satellite broadcast?

H: In the late '80s, after Grateful Med came out, there was an element within the medical librarian community that felt that NLM was essentially undercutting them, and hospital librarians felt this more. [Editor's note: Grateful Med, supported and in use 1986-2001, was the end-user interface to NLM databases including MEDLINE.] And, of course, we had this really bad mistake that was made, when a letter signed by Don was sent to hospital administrators [in November 1989] and did not mention libraries there at all. Just said, "Grateful Med is great; you should look into this. This would be helpful for clinicians in the hospital." It was just a major mistake. There were a lot of people who might have caught the mistake who never saw the letter before it went out, and they were all honest enough to say, "But maybe I wouldn't have caught it." This was a letter that went out to hospital administrators, which I believe I am correct in saying was not seen by Becky [Lyon] or Lois Ann, and I don't believe it was seen by Kent [Smith]. You could have possibly thought that any one of those three might have caught this. This infuriated hospital librarians at a time when they felt really under siege, and they blamed Dr. Lindberg. They felt that he just wanted to serve physicians directly and he didn't care about them. The fact that the reason they didn't pay for DOCLINE was directly related

to a decision that he made, even though the recommendation from others even within Library Operations was not that—it just didn't matter.

B: And it added to the fear that some in the profession were feeling when end-user searching was coming along.

H: Absolutely. And it was like we were doing it on purpose—not "we," of course, Don Lindberg. It was amazing. I really do understand it, but people were very intemperate in their language. Maybe now we're so used to it, we wouldn't even notice it. But people seriously were telling Lois Ann that she needed to resign. And of course, Lois Ann said, "Well, it wouldn't be a reason for me to resign, because I think that what NLM's doing in this area is good."

We were also trying to encourage use locally, so there were these new pricing arrangements—the flat fee. The flat fee was totally based on analysis of use and so forth, and there were actually some people in the library community who figured it out in their heads that they were being charged more, so that we could have a low flat fee for these clinicians. Some of them communicated directly to Don about this.

B: Because this was back in the days when you were charged by both the time you were online and the amount of data you were transmitting.

H: That's right. We came up with a flat fee that was something that would cover this. It was entirely independent of what libraries were being charged. There was never any reason or thought. And those messages to Don were very hurtful. Think of if you reduce this to the worst possible terms. What are they accusing him of? Something really bad. So this was a very fraught period.

During this period, I came up with this notion. I had been involved in a satellite broadcast that had to do with the EHRs or something—I don't know what it was. And these people were interested in doing more in the health area, and people in AHRQ had done things with them. This guy came in with a proposal asking whether there was some program NLM wanted a satellite broadcast for. I actually found this message—it's in my papers—where I sent a little brief note to Don saying, "What about a broadcast that highlights both the importance of hospitals' connectivity to the Internet, and the important value of libraries and librarians in hospitals?" And he came back and said, "Brilliant idea. Let's do it." I got involved in organizing this broadcast. I wanted NLM and the network [NNLM] to get credit for doing it. MLA was a partner, but they didn't need to improve their PR with the hospital librarians, but Don and NLM did.

We were going to have a panel of hospital librarians. We were going to help organize this thing. That's when I cemented my relationship with some of the great hospital librarians at that time, because we asked the RMLs [Regional Medical Libraries] and MLA to suggest some people that they thought would be good to be on this, and we took some from each category. This was people like Kay Wellik and Nancy Fazzone. There

were all these great people. We were going to feature them on the broadcast, but there were going to be other people on the broadcast.

This thing ended up being four hours long, and it was broadcast in two two-hour segments, although we did it all at once. [Editor's note: "Information STAT! Rx for Hospital Quality," broadcast October 22 and November 5, 1992, profiled critical roles played by health information professionals in improving hospital quality and cost effectiveness and was aimed at a target audience of health care administrators and physicians.] There were two interviewers. One was Don and the other one was Jim [Hartz]. He was on network television [on NBC and PBS, including the *Today Show*]. He was very, very good at this kind of thing. Organizing this thing was very stressful. I didn't want anything to be said in this four hours that would be likely to engender the response of, "See? Don Lindberg doesn't get it. He doesn't care about us. He just wants to serve physicians." So I was editing everyone's script, and ones I had to edit the most—or at least suggest that maybe this would not be good, and did you really mean this, and would that be a better way of saying it—were the ones from the librarians. Because the ones who were out there really doing these interesting things, like Susie Long up in Montana, they were just doing their thing. They were thrilled to be providing access through Grateful Med.

We had to deal with all this. It was very stressful for me. And in the midst of all this, it began to seem as if this was a very fly-by-night organization I was with, and were they paying the bills? Would we all get down to the studio and discover that the door was locked because the bill hadn't been paid? However, the hospital librarians were very pleased by this. Bernie Todd Smith—there were all these great people who were involved in this, and some of them I had dealt with before, but we kind of bonded through this experience, and that stood me in good stead going forward. And the thing was successful, because NLM had obviously spent a lot of time and effort and resources to do this and to do it in a really good way. So it stood us in good stead. It was interesting because Don's interviews were great, and he was getting live instructions— "Now, you have to stretch this one out a little bit more"—and he just came up with another question. He was the one who interviewed Trudy Lamb; he interviewed Margaret Bandy about consumer health information. Anyway, it was good.

So I had these things, where even though I wasn't regularly working with people, I had these things where I really connected with them, and so a lot of people knew me, and of course I'd be involved in different programs and so forth, so I was always pretty popular with the MLA crowd.

Where I felt I could do more with the network was when I was associate director for library operations, and I made some changes and did some things during that period that I thought, maybe not necessarily earth-shattering by any means... First off, there were people who wanted us to extend the existing [NNLM] contracts and rethink the national maximum charge [for interlibrary loans] and change the whatever. I went down to AAHSL [Association of Academic Health Sciences Libraries] to explain why it was we weren't going to do that, and where our [priorities] did or did not overlap and how I'd

like to move forward with AAHSL. That was good, because we had some AAHSL members whom I respect and admire greatly, like Rick Forsman, and they were very disenchanted with the network program, which really was being disenchanted with their particular RML, really. So that was good.

I said we were never going to have a site visit team to anything in that program that didn't include some members of minority groups, and we were never going to have one that didn't have a hospital librarian. That had happened quite a bit in the past, but, on my watch, it just had to happen. We had a number of teams that were chaired by minority physicians and so forth.

I also said that we should set it up so that we had some national goals [in the NNLM]. The five-year program that I had the most impact on had a goal that related to reaching all public libraries and also reaching public health departments. It was in that mode where they developed the approach to public health.

B: [Partners in Information Access for the Public Health Workforce]?

H: Well, this was almost like a sequela of that. This would be our opportunity to do it. They call it a [logic model]. It's a method of designing a public health intervention. We used those and people all contributed to them. Various RMLs contributed to them. We had this national thing we could measure, which I thought was a pretty good idea.

I also wanted—and I think Angela [Ruffin] implemented this well—I wanted people to think that if they had a good idea, NLM might fund it, that there was no automatic no. There might be a no. And that they didn't have to go outside the RML structure and Library Operations to figure out how they could fund a good idea through the RML; it wasn't necessary for them to talk to Elliot [Siegel] or Don. They could do that; I had no problem. But if they had something they wanted to fund or they felt that it was good that it could come up this way, maybe there would be a way to provide funding for it.

It is, I think, a very important program. We have many ways of reaching people and we have ways of reaching some people where the old ways won't work, but I'm not convinced that there aren't some programs or some people where you have to start with somebody who can look them in the eye, go look at their operation, see what their problem is, or walk down the street with them, and try to organize something that will really be responsive to what it is that will really help them, as opposed to sitting anywhere, here or even in the state capital, figuring out what's best for that group. I just don't think you can do it.

B: So that was a little later in your career with involvement for MLA. You mentioned that Elizabeth Myers said to you that you should join professional organizations. Early in your career, can you think about some of those first MLA meetings and what they were like?

H: Oh, I've written about it in my article [based on Humphreys' Doe lecture presented in 2001]—the first MLA meeting I attended I was supposed to speak, and I was speaking about the plan for the master serials system. This was in the spring of 1975. I was going to talk about this new project of NLM's in a session that was chaired by Estelle Brodman. Estelle introduced me by essentially saying, "Whenever I travel around the world, I'm always struck by how fortunate—when I look at other countries' medical libraries—we in the United States are to have the leadership of the National Library of Medicine. It's too bad that NLM has never shown this leadership in the area of serials automation. And Betsy Humphreys is here to tell you about the latest plans in this area." I mean, she literally said that [laughter]. And that was a lesson to me. I don't think I ever would have done that to anyone else. But I thought to myself, she doesn't know me. She does not know me. She doesn't know whether an introduction like that is going to turn this person, who in May of 1975, I would have been twenty-eight years old—and twenty-eight for one month, because my birthday was in April… She doesn't know me.

B: She could have undermined your program right there [laughter].

H: Maybe I'd become catatonic. Maybe I'd burst into tears. What's going to happen? But fortunately for everybody in the room, I thought it was kind of funny. I had been agonizing over this thing, and I actually had asked her the night before—there was some reception where I got to meet her—and I asked her what did she think would be most helpful, and she said, "Well, it's your talk. You have to decide what's most important." Which is true.

I then realized I was dealing with—and many people have commented—one of the most brilliant people ever to be a medical librarian. Beautiful writer, interesting thinker, did wonderful things—automation, advances. Really can't say enough good things about her. But she really didn't demonstrate any ability to put herself in somebody else's position and think about the impact of what she said and how she said it. So that was very memorable.

I joined ALA, I think, but I didn't go to ALA until...   I went a couple times when it was in Washington, when I was part of a group that was looking at this whole idea of building a national serials clearinghouse in the United States that would be similar to the National Lending Library [for Science and Technology, in the U.K.], or a database or something. It had to do with serials. I was put on this committee by NLM [the National Commission on Libraries and Information Science (NCLIS) Advisory Committee on a National Periodicals Center], and I think I attended meetings that were held in association with ALA, maybe once in Chicago and once in DC. But I did not start attending ALA in a regular way until I was chief of technical services, which would have been in the early '80s, and then I attended Big Heads—

B: Heads of technical services at the big libraries.

H: Exactly. And that was a very instructive experience for me when I saw the total distinction between the way technical services people in large research libraries

interacted with the Library of Congress representative, who, in the first meeting I was at, was probably Henriette Avram—and there were other people—versus how the technical services people in health science libraries interacted with NLM. It was just a totally different thing.

B: In what way?

H: LC would announce these plans. We were all in the midst of AACR2 implementation [Anglo-American Cataloguing Rules, second edition], and in retrospect, this, that, and another thing. There were a number of things where the LC policies were not beneficial to us, and we had questions about them and whether MARC [Machine-Readable Cataloging] was being held back just because LC had its own internal processing problems—and of course that makes a certain amount of sense.

I was in this meeting, and they were talking about some things. Some of these things just didn't seem like they would be very helpful to me, so I started asking questions. You could see that they were sort of critical questions. And no one was saying *anything*. I waited; I was the new kid; I waited. But nobody said anything. Then later, I would be having coffee or a drink with these people, and they would say, "You're really right. This is terrible." And I realized that the reason they didn't [speak up was because] they didn't feel they would have any impact. When this really came to me, I said, "Gee, they don't think they can raise an issue—nothing's going to happen."

That same year, I was invited to speak to the Health Sciences OCLC Users Group meeting. Also technical services people, as you would imagine. I was invited to come and speak to this group, so I went down to speak to them. I was giving them an update on what was happening with loading NLM records into OCLC, a continuing saga, but things were going along—some of the changes we were doing and what we were doing with holdings and how we were moving ahead. Then I got a huge number of negative—I didn't feel it was particularly bad, but people were saying, well, what about this and what about that, and can't you do something about this and that. Pointed [questions], but they weren't nasty. I was responding and saying, well, we'll probably do this and we can't do that, and this you could help us with, because if they don't hear from you, I don't think they're ever going to do this. So it was a good discussion.

Afterwards, the person who invited me to do this, Ginger Saha, who was then, I think, an [assistant] director at Cleveland Health Sciences Library—the one who had the History of Medicine Division for a while [editor's note: the Army Medical Library (today's NLM) sent rare and valuable materials to Cleveland for safekeeping during World War II]—and later became director of it and has since retired. But a lovely, nice woman. She left and said, "Betsy, I didn't realize that I invited you here for people to shoot at you." And I said, "Ginger, this is great. I think it's a big compliment." People complain to NLM. Health science librarians complain to NLM all the time about this, that, and the other thing. They don't always agree, but we get all these suggestions and complaints. And I take it as a compliment, because I believe they think, A, we will listen, and B, we might

actually change it to make it better for them. Not always, but it's worth a shot. We've done it enough times in the past.

It was amazing to me. And I found out afterward—because someone reported this to Lois Ann—that people felt that I spoke too much at the Big Heads meetings [laughter], that I was bragging. But they would bring up some issue and they would say, "Well, what is anyone doing on this issue," or "Is anyone making progress on X?" And it felt like, well, this is a discussion group. So if NLM actually has made a lot of progress on X or has something interesting, isn't it my role to bring it up here? But in one of these meetings, I think the problem was that NLM had something interesting to say about everything, and I should have picked... It was good advice; it was probably true.

B: So you gave the 2001 Janet Doe Lecture, which was titled, "Adjusting to Progress: Interactions Between the National Library of Medicine and Health Sciences Librarians, 1961-2001." I'd like you to talk a little bit about how you decided on that topic, and what do you think it would look like in 2017? What would be a sequel to those interactions between NLM and health sciences librarians?

H: Well, it's easy to tell you how I came up with the topic. As I listened to Doe lectures and knew what everyone was going through to do this, I figured that at some point in my life, somebody might ask me to give this lecture. It wasn't inevitable, but good chance. And I thought to myself that if I ever get the chance to do this, if I ever have a reason to concentrate on this, I am really going to look at this issue of how NLM ends up in these situations where we seem to be at odds, or there's a real negative reaction from some segments within—some people within the [Medical Library] Association. What's happening here? Why does this occur? They're, by and large, good, extremely well-meaning people. We are too. Tremendous amount of overlap here—a lot of our goals, what we're trying to accomplish. What is going on? And I packed that thought away in my head. Then I was asked, and I said, "Okay, I'm really going to look at this."

As is frequently the case with me, I did a huge amount of research, and the research went on and on and on. I really did a lot of work on it… And then I suddenly realized that I really hadn't come to the point yet and this talk was coming up and I needed to write this talk soon, and I needed to have a way of doing it. That's when I decided, okay, I'm going to do this based on decades, and I'm going to have a few sources that I look at, at that moment at the beginning of each decade, to summarize what the state is. And then I'm going to highlight some of the major things that happened in that decade, and then what did that mean. When we get to the next decade, what is the situation?

It was a lot of work. I really enjoyed doing it, and while I was doing it, I was also working at the same time on two other things that were pretty major in terms of outside talks and things. One was for some anniversary of AMIA [American Medical Informatics Association], where Don and I collaborated on an article about looking at the first twenty-five years of the meetings and what did that show us and aspects about it. And somewhere in that same period, I was also involved in this [national] public health informatics agenda. In the same period I was working on [the Doe lecture], shortly

thereafter I had several big papers I was working on—the others were with other people; this one was the biggest.

But that's why. I just said, there's an underlying reason here, and what is it. And, of course, it was change. It was change that either really affected or radically added to the set of relationships between NLM and the group. The grant program—that was another one that really caused a huge amount of *Sturm und Drang* between the medical libraries and NLM, and that was with Marty Cummings. The other one was when we developed services that could be used directly by physicians and other health professionals. That was the Grateful Med one.

If I were going to update this now, I think what I would say is that what's happened since 2001 is visible support by NLM for the expansion of roles of medical librarianship in a variety of areas, and this is a good thing. So we haven't seen anything like the disruption. And we also have had, since 2001… we've also had an intensification of one of the relationships between NLM and the medical library community that has been highly beneficial to NLM—that is, going way back, they were supporters of NLM. They were visible supporters even when they hated Marty Cummings or they hated Don Lindberg or whatever. They were down there, they were supporting legislation to support us. And, of course, big-time, since 2001, they supported public access. Big time. Really going out there in a variety of places and being a real enabler for improving adherence to the NIH Public Access Policy, being, in general, very supportive of open access. I would say there have been opportunities that were well adopted by NLM, or NLM took advantage of the opportunities, to promote the benefit of involvement of librarians in a variety of new areas—disaster preparedness would be another one—that we have actually expanded. It's not like we didn't do it before, but there have been these opportunities.

On the other hand, the Medical Library Association, the medical library community—there have been some really important national programs that NLM was playing a leadership role in, among others, of course, where they could really chime in to help advance those causes, and in the face of some fairly stiff opposition from various things, where the medical library community really made a big difference, in my opinion.

I might be missing something, but I don't think we've had anything like the *Sturm und Drang* of the implementation of the grant program and this whole business about services that could be used directly by health professionals. I don't think we've seen anything like it since then.

Consumer health, too. Of course, they were already there, and now we had services.

B: Right, because for many years we had said, can't afford that; it's not really something we can do—finally in the late '90s.

H: Well, it really was ubiquitous access to the Internet that made it possible. And I mentioned that [in the Doe lecture] because we were already on that page in 2001, so I

did mention it. This was well accepted and was something that was really beneficial. And in 1997, when MEDLINE became free, what's not to love there?

But I really feel that we've had some big-ticket items where their support really mattered, and they gave it. A lot of people spent a lot of time and effort. Obviously, it was beneficial to them, too, but they were putting in a lot of work to make certain programs successful.

The other thing is, I think, we've done a fair amount—the data stuff, the genomics things, the disaster preparedness specialization, even the consumer health one, which came along after that point. I think working with MLA about these things promoted important roles. Health literacy. Informationist. We've provided some useful support of those activities.

B: Absolutely. Speaking of supporting activities, you've been a strong supporter of professional development, especially through our NLM Associate Fellowship Program and diversity in those programs. Can you talk about the AAHSL—the Association of Academic Health Sciences Libraries—fellowship [NLM/AAHSL Leadership Fellows Program] that NLM cosponsors with them and how that came to be?

H: I guess it would have been in the very early '80s—that time frame—there was a program for mid-career health science librarians that was sponsored by NLM in conjunction with the Council on Library Resources [the CLR/NLM Health Sciences Library Management Intern Program was funded by NLM and administered by CLR during 1978/79 through 1980/81]. It was funded to take people who had real leadership potential and put them in a program. Some outstanding people went through this program, Carol Jenkins, one of them; Joan Zenan was another one who was in it. There were some very good people selected for it. But it was a program that was not readily available to many people, because it really required relocation of these people. It required them to not be in their jobs where they were for a whole year and move them around. And so we ran out of good candidates. Don was involved at the time. He was on the selection committee. The problem with it was that they ran out of top-notch candidates, because people had families, they had jobs. It was providing a good thing, but it was providing it in a way that some of the best people who could take advantage of it just literally couldn't deal with the parameters of the program.

So when AAHSL people came to talk to me about this, they had—Faith Meakin, I think, had done the [retirement] survey—come up with a notion of how many of the directors were going to retire within a relatively short period of time, or within the next five to ten years, and where were these people going to come from. Also, there were some well-known cases where there were outstanding candidates within a particular institution, but the leadership of the institution, in recruiting, felt they had to get somebody who was already a director somewhere else. People were robbing [other libraries], and there weren't enough [current directors] to go around or wanted to move. There wasn't anything to put, in some ways, a seal of approval, or some level of gold-star recognition on the forehead of somebody who worked for you already—who might be in an associate director position or whatever.

[AAHSL] had been looking at all of this, and they came up with the design of this program which involved, in large part, the same general dimensions as the program does now. Originally, the training modules and so forth were contracted to ARL, because DeEtta Jones was at ARL the time, and maybe [Kathryn Deiss] as well; I can't remember that. They've tweaked it, and it's better than it used to be, but the general parameters were the same.

What it meant was that yes, your institution had to support the fact that you would be away for a couple of weeks, that you would have these [site visits to your] mentorships, and that you would be attending related [meetings], although they were funded, so it wasn't a real hardship. Having people spend their time on this—however, it was a manageable thing. They weren't taking the deputy director for a year.

When they came and spoke to me about it and asked about the time and the money, I thought to myself, well, this sounds like this is a really good program. What had bothered me up to that point a little bit was that in terms of training and development of librarians, I had heard quite a bit about this. But people seemed to be approaching it from the point of view of NLM should do something, should fund something, and you should figure out what it is that you should fund. And I thought to myself, I really love this [AAHSL proposal]. These people have analyzed the problem, they've come up with something, it may not work, but it seems like a perfectly plausible thing to try. And all they want us to do is write the check. That's a big contribution. But when people want me not only to pay for it but to figure out what it is I should pay for—I liked this much better [laughter]. I came back and explained it to Don. Of course, Don had been involved with the earlier program and he knew it didn't work, and he said, "Well, maybe this one will work, because it seems like it's something that people can really participate in. They don't have to remake their entire private life or give up their job to do this." He was a very strong supporter of it right from the beginning.

It obviously has filled a need, and people continue to get good candidates. The AAHSL libraries back it by participating and being involved in it, and it seems like it's been a tremendous success across the board.

B: Yes, it's starting its [sixteenth] year. So you've also been very involved with AMIA. Can you talk a little bit about your involvement with that professional organization and why?

H: Yes. Don was the first president of AMIA, and it was established by linking several organizations. Today you would say, well, my goodness, how could the director of NLM be the president of an association like AMIA? Given the subsequent development of the organization, that's a perfectly reasonable question. But at the time, in addition to there being less scrutiny of things like that, the whole focus of the first two years of the association was getting it up, getting over the difficulties of merging the three organizations, and focusing on getting the meetings organized and getting the whole thing operating in a reasonable way. [Editor's note: AMIA (American Medical

Informatics Association) was formed in 1988 by the merger of AAMSI (American Association for Medical Systems and Informatics), ACMI (American College of Medical Informatics), and SCAMC (Symposium on Computer Applications in Medical Care).] The organization was not focused on anything like lobbying the National Library of Medicine or the NIH to spend more money on informatics research or changing policies that affected AMIA members. If that had been a focus, it obviously would have been a real conflict of interest for Don to be president.

I became a member of the AMIA board, and my interest in it was to underscore—and it was an interest to the association as well—that medical librarians were one of the target groups of AMIA, that it was multidisciplinary activity and medical librarians could be involved, had been involved, and were involved, and the presence of me—and there have been other librarians on the board—was sort of underscoring that they're part of the group.

I was always quite in favor of illustrating or helping, or trying to get medical librarians to be interested and brought up to speed, and make the contributions that I believe they absolutely could to informatics developments in their institutions. Obviously, that was one of the motivations for the Woods Hole course—to give people a background. That was not my idea—it was a great idea—but to give medical librarians a background and to have them interact with other types of professionals in a multidisciplinary group, and get a better appreciation for what they knew that the other people didn't know and what they could contribute, in addition to learning the stuff that they might not have been familiar with. It's sort of to get over this business of what can I contribute. Well, in that environment, I think it actually became pretty clear to the librarians who were participating that their knowledge, expertise, and experience could easily be contributed to institution-wide things in the informatics area.

B: What issues do you see that medical librarians need to address in the future that we haven't quite embraced?

H: I don't know. I always feel like every good idea of what a medical librarian should be involved in, I might have received from somebody out in the field who was already there. One of the things that NLM has been useful for, and what the network program continues to be useful for, is this amplifying effect, where somebody—and AAHSL and so forth the same way—is collaborating with these groups to really highlight [what librarians in the field are doing].

We had the informationist supplements for these grants [NLM Administrative Supplements for Informationist Services in NIH-Funded Research Projects, devised and implemented by Valerie Florance]. Neil Rambo brilliantly was new [at New York University Langone Medical Center] and didn't have anybody in particular he could approach about this, so he took the systematic approach, looked up everybody who had a grant at the institution that was signed on for this supplement, and sent them all a message saying, do you have any interest in this, and several of them responded. He ended up with two of the original grants.

But I think that it's really true that almost every good idea I ever had about what a medical librarian could do was because it was just a little extension, or it was the actual thing that somebody was doing in a particular place. And if it works for them, why don't you try it too? I do feel if people focus on what is their institution's set of issues that relates to collection, access, management of information or data, whatever it is, if they can figure out a good way to contribute to it, they ought to do it.

I do feel that some of it relates to this thing I learned from Liz Myers, which is, don't go over there just to talk about what you know you can do or a particular thing where you're already collaborating, but see if you can't—through osmosis or whatever methods are available—find out what is the issue with them, what are they thinking about. Then you're in a position to say, oh, I know so-and-so is interested in that and I've just found this out. Maybe he or she doesn't know this. Maybe I'll tell them.

One of the things that I always tried to do, and I think we all have done it, but I always tried to brief the MLA audiences about things that were coming from NIH—new policies, new things that were going to lay down on people in their institutions—where they might be helpful. Because they would have heard that there was a reg, or they would have somebody who should know this, and they could say, "Well, have you heard about this? It looks like this is coming down the pike," and then they might be able to say, "Is there a piece of this we could help you with"; or, "We thought about this. Would that be helpful?"

B: Tell us a little bit about how those MLA updates came about, why we ended up getting that part of the [annual meeting] program.

H: Yes. It had to do with this very difficult interaction that arose from—I say the real cause of it was the grant program, because it just put NLM and the potential grantees in a set of relationships which they were unfamiliar with and didn't really understand. Everything suddenly became a big problem and issue.

B: And some MLA members felt caught off guard by NLM, you had said.

H: Yes. Well, they always felt that they should know everything that NLM was going to do before it did it. We've all gotten over this to an extent. They still feel this way, but everyone is used to a faster pace. Back then, all of a sudden, it was like NLM was changing some piece of infrastructure or some policy, and they felt like they were being caught not knowing.

So it was quite an adversarial environment in which the MLA/NLM Liaison Committee came into being. I would say that was probably in the [mid-]'60s or something like this, and it went along for a while [until 1987]. That committee would sponsor sessions at MLA, and they would say, "People need to know more about the plans for MEDLARS III..." The first time I focused on this group, I was giving a presentation about MEDLARS III.

We got over this. Things got on to a friendlier footing. MEDLINE had come up, and people were now feeling good; they were getting this training. We figured out a way to train more people. It was the issue of, why can't I get training? So-and-so has training. So we expanded the programs and made them more accessible. The hospital librarians came in to meet with us. [Editor's note: On January 30-31, 1978, hospital librarians from the eleven regions of the Regional Medical Library Program were invited to NLM to discuss the needs of hospital libraries and their relationship with NLM. The meeting was dubbed the Bethesda 11.] Anyway, things were better, and people said, "We don't really need this committee." NLM's position was, look, if anyone has a question for NLM and thinks something is wrong, why wait until this meeting or bring it up through this vehicle? Just get in touch with us, and we'll try to answer it. That was working better. We had customer service.

So they said, "Okay, we don't need this meeting." But, they were still worried that maybe we wouldn't tell them what was going on, therefore it could be disbanded and it was, but there was an agreement that NLM would present an NLM Update of at least one hour at every MLA annual meeting. And you could say, why do we need to do this, but of course, you've been there. Apparently, people still find it useful and like it, because they definitely vote with their feet. The room is always full, even though we're not on the first day of the meeting. It just seems like, from time to time... I've had some interesting interactions where they thought that somehow NLM had done it—we had *demanded*. We said, "Look, it was the MLA board that decided this had to happen." And as long as they invite us and say, "Do it," we're going to do it. "Well, I bet you wouldn't feel so good if it wasn't on this XYZ morning," and I said, "Look, I'm here to tell you that whatever time we're assigned, there will be a roomful of people here from NLM to present." We're not the ones who set the schedule.

You do sort of wonder. You could just check the [NLM] website. But one of the things that is also important is highlighting certain things, because it's like all of us, we don't connect the dots. There's this new thing. Okay, this is good. But one of the things this might be good for is, it might be helpful to this group in your hospital. And it's kind of like, there's so much out there. I think it's very important for someone to stand up and say, this is what it is, and by the way, people have been using it for this and they found it useful. And then someone says, oh... And I will tell you, it almost is without fail that somebody comes up to me after I have done an update at MLA or at a chapter meeting and says, "Betsy, you always tell me something I can use." So, good.

B: Which means we did our job in that update.

H: Yes, we highlighted something they hadn't noticed. I mean, life goes by you, and it's like anything else. There are always the N percent that don't get the word. And that's one of my best pieces of advice: Never assume that if you haven't heard something that you didn't hear it because of malice aforethought. It could just be that the other folks are really busy, just like you are.

B: So you've mentioned a lot of people who have influenced you in your career. Is there anybody you didn't mention or that you want to highlight in particular?

H: Working with all these people on the UMLS was really instructive, and I probably could mention a number of these people. All my interactions with the people at Lexical Technology, and maybe with Mark Tuttle being at the head of that list, that was always very stimulating, generating ideas, and a different perspective that was very valuable to me.

I probably mentioned David Lipman before, but the same. Really. A lot of the way I framed what NLM's role was in digital preservation and looking at preservation as permanent access—in some cases a lot of this was really based on some conversations I had with David around these issues.

B: And looking back on your career, this is probably a nice way to close today, but who are some of the people you feel like you were able to influence the most?

H: That's a hard one for me. A lot of people write me. I've gotten wonderful messages saying, "You've been an inspiration to me." You don't even know. You don't even know. I think there have been a number of people who have looked upon me as giving them a different view of what librarians could and should do, where they could make a contribution where maybe they didn't think [they could]—or that wasn't the first thing that came along.

I had a lot of interaction with a lot of [NLM] associates. For years I was the advisor on the projects. It's an older cohort now, but some of them would remember things that I interacted with them about. A lot of people tell me, and some of them surprise me.

B: I'm sure some of them will be reading this oral history at some point and you'll be influencing people far after this. Thank you very much.

H: Thank you.

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Council on Library Resources (CLR)/National Library of Medicine (NLM) Health Sciences Library Management Intern Program, 50-51

CPT. *See* Current Procedural Terminology

Cummings, Martin M., 3-4,9,21,41,49

BETSY L. HUMPHREYS

Employment History

Deputy Director, National Library of Medicine (NLM), Feb. 6, 2005 – June 30, 2017
Acting Director, NLM, April 1, 2015 – Aug. 14, 2016
Associate Director for Library Operations, NLM, May 1999-Jan. 2005
Assistant Director for Health Services Research Information, NLM, 1993 -2006
Project Director, Unified Medical Language System, NLM, 1986 - 2006
Deputy Associate Director, Library Operations, NLM, 1984 – April 1999
Chief, Technical Services Division, NLM, Dec. 1980-Jul. 1984
Deputy Chief, Technical Services Division, NLM, Nov. 1979-Nov. 1980
Assistant Head, Serial Records Section, NLM, Mar. 1976-Oct. 1979
Librarian, Serial Records Section, NLM, Jan. 1973-Feb. 1976

Education

MLS, University of Maryland, College Park, 1972
BA, Cum Laude (History), Smith College, 1969

Honors and Awards

Member, National Academy of Medicine (formerly Institute of Medicine), 1999 -
Fellow, American College of Medical Informatics, 1990 –
Fellow, Medical Library Association, 2008-
Founding Member, International Academy of Health Information Sciences, 2017-

AMIA Leadership Award, 2017
SNOMED International Lifetime Achievement Award, 2017
SNOMED International Award of Excellence, 2017
U.S. President's Distinguished Rank Award, Senior Executive Service, 2017
Carla J. Funk Governmental Relations Award, Medical Library Association, 2017
Food and Drug Administration Leveraging Collaboration Award, 2016
Smith College Medal, 2012
Food and Drug Administration Leveraging Collaboration Award, 2011
U.S. President's Meritorious Rank Award, Senior Executive Service, 2009
Morris F. Collen Award, American College of Medical Informatics, 2009
Marcia C. Noyes Award, the Medical Library Association's highest honor, 2007
Cornerstone Award (1st recipient), Association of Academic Health Sciences Libraries, 2006
President's Award, Medical Library Association, 2004
President's Award, American Medical Informatics Association, 2002
Alumna of the Year, University of Maryland College of Information Studies, 2002

NLM Regents Award for Scholarship or Technical Achievement, 2001
Janet Doe Lecturer, Medical Library Association, 2001
Vice-President's Hammer Award, as member of NLM Systems Reinvention Team, 1999
National Institutes of Health Director's Award, 1990
National Library of Medicine Director's Award, 1988
National Institutes of Health Award of Merit, 1978
Beta Phi Mu, 1973
Phi Beta Kappa, 1968

Named Lectures

Janet Doe Lecture, Medical Library Association Annual Meeting, Orlando, May 28, 2001.
Priscilla M. Mayden Lecture, University of Utah, October 1999.
Eileen Roach Cunningham Lecture (inaugural lecture), Vanderbilt University, June 1999.
Charles Hunter Lecture, American Association of Laboratory Animal Science Annual Meeting, October 17, 1994

Standards Organizations Service

International Health Terminology Standards Development Organization, Founding U.S. General Assembly Member, 2007-2017   Founding Chair, General Assembly, 2007-2010

Health Information Technology Standards Committee (Federal Advisory Committee to Secretary of HHS)
       Vocabulary Task Force, Co-Chair, 2009- 2012

Health Information Technology Standards Panel, Member, Board of Directors, 2005-2009

American National Standards Institute Health Informatics Standards Planning Panel. Working Group on Codes and Vocabularies, Member, 1993-1996.

National Information Standards Organization
       NLM's Voting Representative, 1999-2010
       Chair, NISO Standards Committee II - revision of American National Standard for Permanence of Paper, 1987 - 92.
       Member, ANSI Z39 Subcommittee F: Publication Patterns, 1980-81

Other Selected Committee Service

Federal Government:

National Institutes of Health
       Institute and Center Directors Precision Medicine Initiative Working Group, 2015-2016
        Administrative Data Council, Member, 2014-
       Scientific Data Council, Member, 2013-2016
       NIH Representative, Federal Health IT Coordinating Council, 2016-
       NIH Representative, Federal Health IT Advisory Council, 2014-2016
       NIH Representative, Federal Health Architecture Leadership Council, 2007-2009
       NIH Public Access Policy Steering Committee, 2005-
        Clinical Research Information System Steering Committee, 2004-2006
        Knowledge Management Governing Group, 2005-2006
       NIH Executive Resources Board, Member, 2005
        NIH Performance Review Board, Member, 2005
Agency for Healthcare Research and Quality. Advisory Committee on Quality Measures Clearinghouse, 2004-2007
National Committee on Vital and Health Statistics. Security and Standards Subcommittee, Staff to Committee, 1997-2006
American Health Information Community. Personalized Healthcare Workgroup, 2007-2008
Department of Health and Human Services Data Council.
       National Health Information Infrastructure Conference (NHII 2003) Program Committee, 2002-03
       Consolidated Health Informatics Initiative, NLM and NIH representative, 2001- 2005
       Committee on Health Data Standards, Member, 1996-2001
       Co-Chair, Codes and Classifications Implementation Team, Health Insurance Portability and Accountability Act, 1997-2003
       Interdepartmental Health Privacy Working Group, Member, 1995-1999
Health Care Financing Administration ICD-10 Procedure Coding System Technical Advisory Panel, Member, 1995-98
Public Health Service Health Data Policy Coordinating Committee, Member, 1994-96
       Program Chair, "Making a Powerful Connection: the Health of the Public and the National Information Infrastructure", April 19-20,1995, National Library of Medicine, Bethesda, MD
National Institute for Standards and Technology, Advanced Technology Program (Health), Technical Reviewer,   1994, 1996.
Department of Health and Human Services Patient Record Working Group, Member, 1991-92.
National Commission on Libraries and Information Science, Advisory Committee on a National Periodicals Center, 1978-79.

National Academy of Medicine (formerly Institute of Medicine):

Elected to Membership, 1999.

Roundtable on Health Literacy, 2006-2017, Member
Leadership Consortium for Value & Science-Driven Health Care. Digital Learning Cooperative.
     February 16, 2016 meeting, invited speaker
Roundtable on Value & Science-Driven Health Care,
     2013, member of planning committee and participant in the IOM-PCORI Workshop on
     Data Harmonization for Patient-Centered Clinical Research.
     2012, invited speaker and participant at meeting on *Continuous Learning and the Digital*
     Infrastructure for Informed Clinical Decision
Committee on Patient Safety Data Standards, 2002, Member, Liaison Panel
National Quality Forum/Institute of Medicine IT Summit, 2002, invited participant.
Workshop on contributions of information technology to improvement of health care quality, 2000, invited participant.
Workshop on National Implications of the Development of Regional Health Data Networks, 1994, Invited guest.
Committee to Advise the National Library of Medicine on Information Center Services in Health Services Research, 1990-91, Principal NLM Liaison.
Workshop on Overcoming Barriers to Patient Record Development, 1990, Invited participant.
Committee to Improve the Patient Record. Technology Subcommittee Working Group Member, 1989-1990
Council on Health Care Technology. Information Panel. Study on Improvement of NLM's Health Care Technology Information Resources, 1988-89, Principal NLM Liaison.

National Research Council. Computer Science and Telecommunications Board

Study of Security and Privacy of Electronic Health Data, 1995-97, defined original scope, served as NLM Project Officer, and directed the preparation of the published background literature search for the project.

Other organizations:

Technical Advisory Panel, Tennessee Regional Health Information Organization project, 2005-2009
Computer-Based Patient Record Institute, Invited Speaker, Second National Conference on Terminology, April 27, 1999
Computer-Based Patient Record Institute, Member of the Planning Committee and Speaker, National Conference   on Terminology for Clinical Patient Description, November 12-14, 1997
Expert Advisor, National Committee for Quality Assurance's Road Map for Information Systems, 1996.

Friends of the Smith College Libraries. Executive Committee, 1996 - 2002
University of Maryland College of Library and Information Service. Health Sciences Advisory
Board, 1995 - 98
NLM/Medical Library Association Working Group to plan and direct "Information STAT!: Rx
for Hospital Quality", a nationwide satellite broadcast program, 1992. Chair.
CONSER Multiple Versions Task Force, Chair, 1988-89
NLM Liaison to Research Libraries Group Medical and Health Sciences Program Committee,
1983-88
Joint Association of Research Libraries/National Federation of Abstracting and Indexing
Services Working Group to Develop a Proposal for Adding Abstracting and Indexing
Information to CONSER Records, 1981-83

Professional Associations

American College of Medical Informatics, Fellow, 1990-
      Membership Committee, 1992-1994; 2001-2003
      Symposium Program Committee, 2008.
      Nominations Committee, 2015.

American Medical Informatics Association, Member, 1986 -
      Board of Directors, 1994 - 1996
      Nominating Committee, 1994 - 1996, 1998
      Meetings Committee, 1995-2000; 2004-2005
      Public Policy Committee, NLM Liaison, 1996-2005
      Standards Committee Advisor, 1997-2000
      Fall Symposium Program Committee, Member 1997, 2008
      Spring Congress Program Committee, Member 1991, 1995, 2001
            Chair, 1996 "Conquering Distance: Teleinformatics -- Telemedicine --
            Telehealth"
      Fall Symposium Student Paper Competition Judge, 1992 –1993, 2000

American Library Association, Member, 1980 -
      Technical Services Directors of Large Research Libraries Discussion Group, 1981-84

AcademyHealth (formerly Association for Health Services Research), Member 1993 - 2008
      Advisory Committee, Health Services Research-in-Progress Database, 1994-2003
      Advisory Committee, Pew Health Services Research Grants Information System, 1992-
      93.

Association of Research Libraries
      ARL Joint Task Force on Library Support for E-Science, Member, 2006-2008

International Medical Informatics Association
>Invited Instructor, MEDINFO '92, Geneva, September 1992
>Invited Participant, Working Conference on the Health Professional Workstation, 1993

Medical Library Association, Member, 1976 –
>Lindberg Research Fellowship Jury, 2002.
>Elected member, Nominating Committee, 1989/90, 1998/99
>Joseph Leiter NLM/MLA Lectureship Committee, 1997 - 99
>Research Task Force, 1992 - 94
>Medical Informatics Section, Chair, 1992/93, Chair - Elect, 1991/92,
>>Program Committee, 1991,1994, 1996
>Awards Committee: Chair, 1988/89, Member, 1987/88
>Frank Bradway Rogers Information Achievement Award Jury, Chair, 1984/85,
>>Member, 1983/84
>Interlibrary Loan Standards and Practices Committee, Member, 1979-81

Editorial Responsibilities

Associate Editor, <u>Journal of the American Medical Informatics Association</u>, 2000-
Editorial Board, <u>Computers in Biomedical Research</u>, 1994 – 2000.
Editorial Board, <u>Information Technology and Libraries</u>, 1983-84.

Selected Publications

Whitney W, Keselman A, Humphreys B. Libraries and Librarians: Key Partners for Progress in Health Literacy Research and Practice. Info Serv Use. 2017; 37(1): 85-100.

Lindberg DA, Humphreys BL. Preface - Access to knowledge revisited. Yearb Med Inform. 2016:11-13.

Read KB, Sheehan JR, Huerta MF, Knecht LS, Mork JG, Humphreys BL; NIH Big Data Annotator Group. Sizing the Problem of Improving Discovery and Access to NIH-Funded Data: A Preliminary Study. PLoS One. 2015 Jul 24;10(7):e0132735. doi: 10.1371/journal.pone.0132735. eCollection 2015.

Miller E, McCaw B, Humphreys BL, Mitchell C. Integrating intimate partner violence assessment and intervention into healthcare in the United States: a systems approach. J Womens Health (Larchmt). 2015 Jan;24(1):92-99.

Ripple AM, Mork JG, Knecht LS, Humphreys BL. A retrospective cohort study of structured abstracts in MEDLINE, 1992-2006. J Med Libr Assoc. 2011 Apr;99(2):160-3.

Lindberg DA, Humphreys BL. Rising expectations: access to biomedical information. Yearb Med Inform. 2008:165-72.

Humphreys BL. Building better connections: the National Library of Medicine and public health. J Med Libr Assoc. 2007 Jul;95(3):293-300.

Lindberg DA, Humphreys BL. 2015--the future of medical libraries. N Engl J Med. 2005 Mar 17;352(11):1067-70

Hole WT, Carlsen BA, Tuttle MS, Srinivasan S, Lipow SS, Olson NE, Sherertz DD, Humphreys BL. Achieving "source transparency" in the UMLS Metathesaurus. Medinfo. 2004;11(Pt 1):371-5.

Yasnoff WA, Humphreys BL, Overhage JM, Detmer DE, Brennan PF, Morris RW, Middleton B, Bates DW, Fanning JP. A consensus action agenda for achieving the national health information infrastructure.
J Am Med Inform Assoc. 2004 Jul-Aug;11(4):332-8.

Lindberg DA, Humphreys BL. "You Have To Be There": Twenty-five Years of SCAMC/AMIA Symposia.
J Am Med Inform Assoc. 2002 Jul-Aug;9(4):332-45

Nelson SJ, Powell T, Humphreys BL. The Unified Medical Language (UMLS) Project. In: Kent, Allen; Hall, Carolyn M., eds. Encyclopedia of Library and Information Science. Vol. 71, Suppl. 34. Marcel Dekker, New York/Basel, 2002, pp. 369-378.

Humphreys BL, Mandl KD, Cahn MA. Bridging the gap in medical informatics and health services research: an introduction. J Am Med Inform Assoc. 2002 Mar-Apr;9(2):125-6.

Humphreys BL. Adjusting to Progress: interactions between NLM and health sciences librarians, 1961-2001. J Med Libr Assoc 2002 Jan;90(1):4-20.

Yasnoff WA, Overhage JM, Humphreys BL, LaVenture M. A National Agenda for Public Health Informatics: Summarized Recommendations from the 2001 AMIA Spring Congress. J Am Med Inform Assoc. 2001 Nov-Dec;8(6):535-45. *–nominated for the 2002 Charles C. Shepard Science Award, Centers for Disease Control and Prevention.*

Yasnoff WA, Overhage JM, Humphreys BL, LaVenture M, Goodman KW, Gatewood L, Ross DA, Reid J, Hammond WE, Dwyer D, Huff SM, Gotham I, Kukafka R, Loonsk JW, Wagner MM. A National Agenda for Public Health Informatics. J Public Health Pract Manage 2001 Nov;7(6):1-21.

Nelson SJ, Johnston D, Humphreys, BL. Relationships in Medical Subject Headings. In: Bean, Carol A.; Green, Rebecca, eds. Relationships in the organization of knowledge. Kluwer, Dordrecht/Boston/London, 2001, pp. 171-184.

Selden CR, Humphreys BL, Yasnoff WA, Ryan ME. Public Health Informatics. Current Bibliographies in Medicine 2001; 2001-2.

Humphreys BL. Electronic health record meets digital library: a new environment for achieving an old goal. J Am Med Inform Assoc 2000 Sep-Oct;7(5):444-52.

Humphreys BL, Ruffin AB, Cahn MA, Rambo N. Powerful Connections for Public Health: The National Library of Medicine and the National Network of Libraries of Medicine. Am J Public Health 1999 Nov;89(11):1633-36.

Lindberg DAB, Humphreys BL. A time of change for medical informatics in the USA. Yearbook of Medical Informatics 1999:53-57.

Humphreys BL. Meeting information needs in health policy and public health: priorities for the National Library of Medicine and the National Network of Libraries of Medicine. J Urban Health 1998 Dec;75(4):878-83.

Lindberg DAB, Humphreys BL. Medicine and Health on the Internet: the Good, the Bad, and the Ugly. JAMA 1998 Oct 21;280(15):1303-4.

Humphreys BL. Do existing controlled vocabularies contain terminology needed for patient records? J AHIMA 1998 May;69(5):30-33.

Humphreys BL, Lindberg DAB, Schoolman HM, Barnett GO. The Unified Medical Language System: An Informatics Research Collaboration. J Am Med Inform Assoc 1998 Jan/Feb;5(1):1-11.

Humphreys BL, McCray AT, Cheh ML. Evaluating the coverage of controlled health data terminologies: report on the results of the NLM/AHCPR Large Scale Vocabulary Test. J Am Med Inform Assoc 1997 Nov/Dec;4(6):484-500.

Lindberg DAB, Humphreys BL. Medical Informatics. JAMA 1997 Jun 18;277(23):1870-1.

Selden C, Humphreys BL. Unified Medical Language System. Current Bibliographies in Medicine. 1997:96-8.

Ackerman MJ, Humphreys BL. A focus on telehealth. [Editorial] J Am Med Inform Assoc 1997 Jan/Feb;4(1):68.

Humphreys BL. Librarians and collaborative research: toward a better scientific base for information practice. Bull Med Libr Assoc 1996 Jul;84(3):433-6.

Humphreys BL, Hole WT, McCray AT, Fitzmaurice JM. Planned NLM/AHCPR Large-Scale Vocabulary Test: Using UMLS Technology to Determine the Extent to Which Controlled Vocabularies Cover Terminology Needed for Health Care and Public Health. J Am Med Inform Assoc 1996 Jul/Aug;3(4):281-7.

Lindberg DAB, Humphreys BL. Medical Informatics. JAMA 1996 Jun 19;275(23):1821-2.

Humphreys BL, ed. Conquering Distance: Teleinformatics, Telemedicine, Telehealth. Final Program and Abstract Book. AMIA Spring Congress, June 5-8, 1996. Bethesda, MD; American Medical Informatics Association, 1996.

Selden C, Humphreys BL, Friede A, Geisslerova Z. Public Health Informatics. Current Bibliographies in Medicine. 1996:96-4.

Auston I, Humphreys BL, Clayton PD, Kohane I, Hoffman L, Geisslerova Z. Confidentiality of Electronic Health Data: Methods for Protecting Personally Identifiable Information. Current Bibliographies in Medicine 1996:95-10.

Lasker RD, Humphreys BL, Braithwaite WR. Making a Powerful Connection: the Health of the Public and the National Information Infrastructure. A Report of the Public Health Service Data Policy Coordinating Committee. Washington, D.C.: U.S. Public Health Service, July 7, 1995.

Lindberg DAB, Humphreys BL. Computers in Medicine. JAMA 1995 Jun 7;273(21):1667-8.

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Harbourt AM, Knecht LS, Humphreys BL. Structured Abstracts in MEDLINE, 1989-1991. Bull Med Libr Assoc 1995;84(2):190-5.

Humphreys BL. [Invited] Comment on "Toward data standards for clinical nursing information". J Am Med Inform Assoc Nov/Dec 1994; 1(6):472-4.

Humphreys BL, McCutcheon DE. Growth patterns in the National Library of Medicine's serials collection and in

Index Medicus journals, 1966-1985. Bull Med Libr Assoc Jan 1994; 82(1): 18-24.

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Lindberg DAB., Humphreys BL. The Unified Medical Language System (UMLS) and computer-based patient records. In Ball MJ, Collen MF, eds. Aspects of the computer-based patient record. New York: Spring-Verlag, 1992; pp. 165-75.

Humphreys BL, Lindberg DAB, Hole WT. Assessing and enhancing the value of the UMLS Knowledge Sources. In: Clayton P.D., ed. Proceedings of the 15th annual symposium on computer applications in medical care. New York: McGraw Hill, 1992;78-82.

Humphreys BL, Lindberg DAB. The Unified Medical Language System Project: A Distributed Experiment in Improving Access to Biomedical Information. In: Lun KC, Degoulet P, Piemme TE, eds. MEDINFO 92: Proceedings of the Seventh World Congress on Medical Informatics, Geneva, 6-10 September 1992. Amsterdam: North-Holland, 1992; 1496-1500.

Masys DR, Humphreys BL. Structure and Function of the UMLS Information Sources Map. In: Lun KC, Degoulet P, Piemme TE, eds. MEDINFO 92: Proceedings of the Seventh World Congress on Medical Informatics, Geneva, 6-10 September 1992. Amsterdam: North-Holland, 1992; 1518-1521.

Humphreys BL, Kalina CR. Revising the American National Standard for Permanence of Paper (ANSI Z39.48-1984): Changing Market Factors, Changing Paper Technology, and New Research Questions. In: Proceedings 1991 Papermakers Conference, Seattle, WA April 8-10. TAPPI Press, 1991; 243-9.

Humphreys BL.. De facto, De Rigueur, and Even Useful: Standards for the Published Literature and Their Relationship to Medical Informatics. In: Miller, R.A. (Ed.) Proceedings; Fourteenth Annual Symposium on Computer Applications in Medical Care, Washington, IEEE Computer Society Press, 1990; 2-8.

Lindberg DAB, Humphreys BL.. The UMLS Knowledge Sources: Tools for Building Better User Interfaces. In: Miller, R.A. (Ed.) Proceedings; Fourteenth Annual Symposium on Computer Applications in Medical Care, Washington, IEEE Computer Society Press, 1990; 121-125

Wallingford KT., Humphreys BL, Selinger NE, Siegel ER, Bibliographic Retrieval: A Survey of Individual Users of MEDLINE. MD Comput 1990 May-Jun; 7(3): 1166-71

Humphreys BL, Lindberg DAB. Building the Unified Medical Language System. In: Kingsland, L.C. (ED.) Proceedings; Thirteenth Annual Symposium on Computer Applications in Medical Care, Washington, IEEE Computer Society Press, 1989; 475-480.

Lindberg DAB, Humphreys BL. Computer Systems that understand medical meaning. In: Scherrer, J.R., Cote, R.A., and Mandil, S.H. (Eds.): Computerized Natural Medical Language Processing for Knowledge Representation. Amsterdam, North Holland, 1989; 5-17.

Lindberg DAB, Humphreys BL. Toward a Unified Medical Language: Medical Informatics Europe '87 Proceedings of the Seventh International Congress, Rome, September 21-25, 1987, Vol. 1, XXIII-XXXI.

Humphreys BL. Acid-free Paper: Stopping the Preservation Problem at its Source. CBE (Council of Biology Editors) Views. 1986 Summer; 9:2;45-47.

Humphreys BL, Arenales DW, Cain J, Parascandola J, Rotariu M, Thoma G, Watson L. Preservation of the Biomedical Literature: A Plan for the National Library of Medicine. Bethesda, MD, National Library of Medicine, Oct. 1985.

Beatty A, Humphreys BL. Serial cataloging under AACR2: Differences and Difficulties at the National Library of Medicine. Catalog Class Q 1983 3:77-85.

Humphreys BL. Cataloging: General considerations and descriptive cataloging. In: Darling, L., Bishop, D., and Colaianni, L.A. (Eds.): Handbook of Medical Library Practice, Fourth Edition, Vol. II Chicago, IL., Medical Library Association, 1983 pp. 183-251.

Amani M, Humphreys BL. Analysis of characteristics of serials held by libraries in PHILSOM which are not in the NLM collection. Bull Med Libr Assoc, 1982 Jul;70(3):324-328.

Fishel MR, Humphreys BL. Description of automated serials control systems: the National Library of Medicine. In: Potter, W.G. and Sirkin, A.F. (Eds.): Serials Automation for Acquisition and Inventory Control. Chicago, IL., American Library Association, 1981, pp. 134-139.

Humphreys BL. Serials control by agents. In: Potter, W.G. and Sirkin, A.F. (Eds.): Serials Automation for Acquisition and Inventory Control. Chicago, IL., American Library Association, 1981, pp. 57-76.