



**ORAL HISTORY PROJECT**

**Frederick C.  
Battaglia, MD**

**Interviewed by  
Lawrence M. Gartner, MD**

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Denver, Colorado

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## **PREFACE**

Oral history has its roots in the sharing of stories which has occurred throughout the centuries. It is a primary source of historical data, gathering information from living individuals via recorded interviews. Outstanding pediatricians and other leaders in child health care are being interviewed as part of the Oral History Project at the Pediatric History Center of the American Academy of Pediatrics. Under the direction of the Historical Archives Advisory Committee, its purpose is to record and preserve the recollections of those who have made important contributions to the advancement of the health care of children through the collection of spoken memories and personal narrations.

This volume is the written record of one oral history interview. The reader is reminded that this is a verbatim transcript of spoken rather than written prose. It is intended to supplement other available sources of information about the individuals, organizations, institutions, and events that are discussed. The use of face-to-face interviews provides a unique opportunity to capture a firsthand, eyewitness account of events in an interactive session. Its importance lies less in the recitation of facts, names, and dates than in the interpretation of these by the speaker.

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## **ABOUT THE INTERVIEWER**

Lawrence M. Gartner, MD

Lawrence M. Gartner was born and grew up in Brooklyn, New York. His undergraduate education was at Columbia University, followed by medical education at Johns Hopkins University, where he received his medical degree in 1958 and pediatric internship from 1958 to 1959. Returning to New York, he continued his pediatric residency at the Albert Einstein College of Medicine, where he was Chief Resident in Pediatrics from 1961-62. He continued at Einstein, doing a fellowship in hepatology, neonatology and research. In 1964 he became a faculty member, rising to Professor of Pediatrics and Director of the Divisions of Neonatology and Gastroenterology and of the Pediatric Clinical Research Center. During this period he carried out a major research program in neonatal bilirubin metabolism. In 1980, he became Professor and Chairman of the Department of Pediatrics at The University of Chicago and Director of Wyler Children's Hospital. In 1998, Dr. Gartner retired from the University of Chicago. He now lives and works from his ranch in Valley Center, California (San Diego), continuing lecturing and writing in neonatal jaundice, breastfeeding and history of neonatology.

In 1956, he married Carol B. Gartner, who subsequently became Professor of English at Purdue University and Dean of the College of Arts and Sciences at the Calumet campus. She also writes and lectures on the history of medicine, sometimes with her husband. She also assists in the oral history project, with specific responsibility for the video recording and photographs that accompany each oral history. They have two children, Alex Gartner, a movie producer, and Madeline Gartner, a breast and endocrine surgeon.

## Interview of Frederick [C.] Battaglia, MD

DR. GARTNER: Okay, we're here in Dr. Fred Battaglia's and Jane's home in Denver, Colorado. I thank you for agreeing to be interviewed for the American Academy of Pediatrics Oral History Project. There are 3 major goals we have for this oral history today.

First, you were a very major figure in American and global pediatrics, and we want to know something about yourself, your early life, your education, your career, your family; how did you get to where you are? Second, we want to record, for future researchers, your scientific, clinical and scholarly contributions in the field of pediatrics. And third, this is a neonatology oral history because we're interested in understanding how the field of neonatology developed, its major achievements and where you see it going in the future. You were one of the creators of the field of neonatology, and we want to know your role in the field.

The interview process is a relatively simple one. I have a script which we have used, with some modifications, for all of the people we have interviewed. This gives a structure to the interview and allows us to cover the same material with each interviewee. By putting together the answers to each of these questions by each interviewee, we hope to be able to reconstruct the evolution of the field and identify neonatology's major achievements.

Thus I will ask some questions, but that's only an outline, and you're free to wander off the topic, add to it, change it, and if thoughts come to mind that are tangential, please put them in. There are no restrictions on this. You will have the opportunity to edit the transcript for accuracy and content. We hope you will not remove anything or make any changes except for reasons of accuracy. I will be editing the transcript, but only to make it readable and smooth, and I will not change anything that you have said.

We're recording this interview both on audiotape for the transcriptionist and also on digital video, with sound, to have an archival record of this interview, including your image, the setting here in your home, and to show any artifacts or pictures you would like to share with us. Carol Gartner is our official photographer, and she will do both video and still photography throughout the day. She is also a medical historian and may ask some questions, herself. She has a copy of the script.

Okay. We can expect the interview will take nearly the whole day. There is no time limit. We want this interview to be as complete and comprehensive as possible. I will indicate by raising my hand that I want you to stop for a moment when I have to change tapes, although when Carol has to change tapes, she'll indicate that to us. Please stop at that moment. Just hold the thought until I get a new tape in. We don't want to miss anything. And then we'll continue on.

Whenever you want to stop, just let me know, and we'll take a break at any time. So please relax. Enjoy it. I think it will be fun. I hope it will be fun.

We will now begin, and we're going to begin with personal history, with you and your personal biographical information and anything you want to add to that. So what I'd like you to do is start by talking a little bit about your origins: your parents, your ancestors, where you were born, siblings, family life, anything in your early schooling, your early years.

**DR. BATTAGLIA:** Okay. My family background is that my dad and my 4 grandparents were all born in Luca, a small town near the coast in Tuscany, about an hour drive from Florence. We've been there many times. My mother was born here in Union City, New Jersey, as I was. I went to public schools through high school. At that time they had a strange system where classes graduated in mid-year, and I was in one of those classes, so you had to fill in for 6 months until you started at college. In my case, I was going to Cornell [University]. So I worked in a radiologist's office in town, doing secretarial work basically. But he quickly moved on to have me learn how to take X-rays, and I learned a good bit about how a private office worked.

Then I went to Cornell, and since I had lost 6 months, I was kind of anxious to save my family some money, and I finished Cornell as a chemistry major in 3 years. I took some summer courses at NYU [New York University] and Cornell, and got all my credits done, and I chose to go to medical school at Yale [University] largely because of their unique program. They had no exams for the students, and everyone was required to do a thesis to graduate. I knew I wanted research, and in their interviews they had stressed they had summer fellowships for students. I was very happy there. I did research every summer, and that really started me out in a direction towards neonatology. It's amazing to me—and I don't know how much you want me to digress—

DR. GARTNER: As much as possible.

**DR. BATTAGLIA:** Okay. It's just amazing to me how much chance plays a role in life, because my wife, who was a med student with me at Yale, had skipped classes in grammar and high school. I lost time and then made it up with that 3 years, so we ended up in the same class at Yale. The other thing is that I had gone as a first-year student to talk with Dr. Daniel Darrow, a famous figure in pediatrics, in water and electrolytes, and I told him I'd like to do research with him, and he said he'd be happy to have me.

Then about a month later, he called me to his office and said because of some real mess in pediatric politics, he was leaving Yale and that he wanted to walk me across the street and introduce me to his friend, Donald [Henry]



Barron, and so he did. He took me across and introduced me, and Dr. Barron said he'd be happy to have me work in his lab. Dr. Barron was working in fetal physiology after he had left Cambridge [University], working with [Sir Joseph] Barcroft. So I ended up in fetal physiology, which led me into neonatology since I enjoyed pediatrics. That was largely chance; I could have been with Darrow.

DR. GARTNER: Which wouldn't have been so bad.

DR. BATTAGLIA: Oh, no. Yale had a system, since they had no exams, whereby 3 students met with the faculty and went over things in whatever subject you were taking. Well, my faculty member was Bob [Robert E.] Cooke, and my attending was Morris Green. Both of them, because of the same political turmoil, left Yale. Morris Green was wonderful, and Jane [Battaglia] and I really loved him. He sold us on pediatrics, as did Bob Cooke.

When we were graduating, there was no match for husbands and wives, and so we were a little concerned. Dr. Cooke was then chairman at [Johns] Hopkins [Hospital] and said to us, "We'd love to have you." We went from Yale to Hopkins. But during the time at Yale, I did a lot of research in Dr. Barron's lab, and he had a steady stream of obstetricians coming to train with him: Harry Prystowsky, who was at Hopkins, and Dr. André Hellegers, and Giacomo Meschia came from Milan, so there were quite a string of people going through there. Jim [James] Metcalf came down from Boston. And I got to work with all of these people.

So when Jane and I left Yale, we went as interns at Hopkins. There was André Hellegers and Harry Prystowsky in Nicholson [J.] Eastman's department, as faculty. Eastman, I had met through Don Barron because they were good friends, so I had a contact in obstetrics at Hopkins. As an intern, I worked with Prystowsky and Hellegers to set up a lab there, and we began work in looking at a number of things in pregnancy. Perhaps the most striking was we did one of the very first studies ever done that used amniocentesis, to collect samples and measure electrolyte concentrations. [Chuckles]

It was an exciting time, and I think everyone who was in pediatrics at Hopkins at that time felt we were there to change things permanently. We really had that feeling. Cooke inculcated that, and it was a time when there were older people like Lawson Wilkins, who was rounding in endocrinology, and Helen Taussig in cardiology, and Harry [H.] Gordon. It was just an array of wonderful people, senior people, the [Harold E. and Helen C.] Harrisons, and so we had all this contact with—if you like historical figures. At the same time there were these young Turks. There was Bill [William] Nyhan, and there was—oh, my goodness—Don [Donald N.] Medearis [Jr] in

**infectious disease, and Saul Brusilow in renal, and Gerry [Gerard B.] Odell in neonatology. There were all these young people at the time, and the atmosphere was wonderful, absolutely wonderful. So that was an exciting, exciting time.**

**Can we take a break for a minute?**

**DR. GARTNER:** Yes.

**DR. BATTAGLIA:** Just to organize my thoughts.

**DR. GARTNER:** Let me just ask you some questions. I want to go back a little bit. Tell me a little bit more about your parents and what they did, what their education was, etc.

**DR. BATTAGLIA:** Okay. Right, right. Well, my dad went at night to Columbia [University] for a degree in architecture, and he worked as the head of the architectural department for J.C. Penney [Company]. They had 1,600 stores, and there were always a couple of them damaged by fire or flood, so that was what he did. He also had a small private practice in the New Jersey area, in architecture, but his basic job was at Penney's.

**DR. GARTNER:** Did he design any of the Penney stores?

**DR. BATTAGLIA:** You know, I never asked him. He did a lot of work with blueprints at home, so sure, he was involved, but it was a large department. There were a lot of draftsmen working with him when I visited in New York.

**My mother graduated high school, the same public high school I went to, Emerson, in Union City, and she didn't work after she was married. I had a sister, Irene, and that was it. There were just 2 of us. I think if you look at people my age, you'll find that almost invariably there's quite a large number of years between the first and second child because of the Depression.**

**DR. GARTNER:** Right.

**DR. BATTAGLIA:** So there's 7 years between Irene and me. I think for almost all my friends, that was true of their sibling. The sibling was 7, 8 years younger because of that rough time.

**My grandfather on my mother's side was an amazing man. He spoke only Italian and did all his calculations at night at the table, but he built a huge tile company and had a lot of real craftsmen from Italy working for him, and they did many of the skyscraper lobbies in New York.**

DR. GARTNER: My goodness.

**DR. BATTAGLIA: Yes, they did a lot of very big buildings in New York. And he kind of held the family together through the Depression. He was a wonderful character. I enjoyed him.**

DR. GARTNER: This is your mother's father.

**DR. BATTAGLIA: Yes.**

DR. GARTNER: What was his name?

**DR. BATTAGLIA: Omero (Homer), Omero Pardi, P-a-r-d-i. And years later, as you know, I did a lot of collaborations with Giorgio Pardi, who's chairman in Milan, and he swears, since his family was from also around Luca, that we're related.**

DR. GARTNER: [Laughs]

**DR. BATTAGLIA: I have no idea if that's true, but anyway—**

DR. GARTNER: And what did your sister do?

**DR. BATTAGLIA: My sister went to Manhattanville College, and after that got a master's in teaching at Yale. That's a long story because she had met Giacomo Meschia, who I worked with at Yale, when she came to visit Jane and me. We were on fellowship at Cambridge in England at the time. This would have been 1958-1959. We took a tour at the end of that year when she was there, and we went to Italy, and Giacomo met us and took us around Italy. Irene and he fell in love, and they got married. He was still on the faculty at Yale, in physiology, and that's why she did her master's in teaching at Yale. So that's a bit of the family background. Takes us to the internship time.**

DR. GARTNER: I have another question to sort of fill in. You said that even before you went to medical school you were interested in research.

**DR. BATTAGLIA: Yes, I wasn't actually sure of medical school. I really was open to other possibilities, although remember that in the fifties there weren't that many choices at college. I mean, there wasn't marine biology, for example, or molecular biology, so biochemistry was really more cooking and nutrition than biochemistry. But I did like research, and I knew that I wanted to pursue it, so when I saw the curriculum at Yale, I said, *That's made for me. That's made for me.***

DR. GARTNER: How did you know you wanted to be a researcher? That's an interesting thing. You didn't do any research before you made that decision.

**DR. BATTAGLIA: No. It was taking science courses at Cornell. Cornell was wonderful for science, really wonderful. I just attracted to it. I still believe chemistry is really the foundation of medicine, but anyway—**

DR. GARTNER: What was the old thing, "Better Living through Chemistry"?

**DR. BATTAGLIA: Yes, yes.**

DR. GARTNER: Good. Well, thank you.

C. GARTNER: When did you and Jane get married?

**DR. BATTAGLIA: Immediately at the end of medical school. We went together for a few years in med school, but our parents, both sets, were very concerned that if we married in medical school we might give up our careers, which, knowing us, is kind of silly. We graduated, and then a week later we married, and a few weeks later we were in the internship at Hopkins.**

DR. GARTNER: [Chuckles] That was your honeymoon.

**DR. BATTAGLIA: No, we did a honeymoon. We went to Bermuda for a week, but it was a short honeymoon.**

DR. GARTNER: Why don't you tell us a little bit about Jane's career?

**DR. BATTAGLIA: Jane got very interested in anesthesiology at Yale because the department there was really wonderful, and Nick [Nicholas] Greene was superb. She was thinking of pediatric anesthesiology, so she decided, since she needed an internship before going into a residency in anesthesia, to do it in pediatrics, and that's what led her to do an internship at Hopkins with me, in pediatrics. Her plan was to do anesthesiology after that.**

**During the internship—well, we've had an interesting arrangement. I make all the big decisions, like: Do we go to war with China? She decides what we'll do next year and where we'll live.**

DR. GARTNER: [Laughs]

**DR. BATTAGLIA: So she said to me, "Look, you know you want to do a fellowship. We're both exhausted from finishing med school and being in the internship, so I will help you, but why don't you apply for an NIH [US**

National Institutes of Health] fellowship to go abroad?” So I said, “That sounds like a good idea.” And I called Don Barron at Yale and talked with him, and [he] said, “Well, Fred, you should go to Cambridge. I was there, and it’s just a lovely place, and you will love it.” So I said, “I’d like to do biochemistry, since I did all physiology research.” So he helped me look up people at Cambridge [University], and that led me to go to Philip Randle’s laboratory. He’s now Sir Philip, but at that time he was a lecturer in biochemistry at Cambridge. I wrote him, and he said, “Yes, if you get the NIH fellowship, we’d love to have you.”

So I applied for the fellowship and got it, and off we went at the end of the internship. Jane said, “Well, you know, there won’t be many ships. Let’s take the *Liberté* across to England.” Funny story about that, typical, I think, of the time for all of us: The fellowship was \$4,000 a year. [When] we finished the internship, we had, like, \$30 to our name, and off we went on this *Liberté* to arrive in England. And I didn’t know how I’d even get to Cambridge from the port. You know, I didn’t have any idea what the train cost.

But Jane’s uncle had been a senior officer in the trust department at Chase Manhattan, and he had given me a card and said, “Go to Barclay and show them this.” So I did that, and Barclay said to us something that, for an American, was unbelievable. They said, “We’ll open a checking account. Don’t worry that you have no money to put in it. You’re physicians, and we trust you.” Honestly.

DR. GARTNER: My goodness.

DR. BATTAGLIA: So I said, “Okay, if you’re not worried, I’m not worried.”

DR. GARTNER: [Laughs]

DR. BATTAGLIA: We went up to Cambridge and had a wonderful, wonderful year there. Jane decided that after the internship she wanted a break to enjoy Cambridge, and she did a lot of reading and just enjoyed herself, immensely. She did some touring in Europe while I was at the lab, so it was a wonderful year. Philip Randle was a great, great teacher. We had a wonderful time. He was a very gracious host. So that was our arrival in Cambridge.

The only thing I remember distinctly is writing NIH, because at the end of a fellowship they say can you give them feedback, and my feedback was, “Why don’t you pay people at the beginning of the month, not at the end?” [Laughter] But anyway, it was a great time, and we had a very good experience at Cambridge.

DR. GARTNER: Sounds wonderful. And what has Jane done in her career since—

**DR. BATTAGLIA:** Oh, okay. So after that year, she wanted to go back to Greene's department at Yale and start her anesthesiology, so I said, "That's fine. I'll go along with you, and I'll work in Don Barron's lab for a year as a fellow," and that's what I did. I did a second year fellowship in physiology while she started her anesthesiology residency. She and I both felt that at the end of that year, we would like to get back to Hopkins. It was clinically so busy at Hopkins that we knew we would enrich ourselves as clinicians.

So Jane continued in her anesthesiology residency at Hopkins while I went back into the pediatric residency, and I finished the 2 years of pediatric residency. Jane, after a year in her completing her anesthesia residency, then went on the faculty in anesthesiology at Hopkins. At that time, it was still a division under surgery; it was not an independent department. But she continued to work in anesthesiology there while I completed the residency.

DR. GARTNER: Did she specialize in pediatric anesthesiology?

**DR. BATTAGLIA:** At that time, she was doing more pediatric cases, but there wasn't such a thing as specializing in pediatrics. So that was part of her training, but it wasn't a specialty. I don't think you could say neonatology existed, really, at that time.

DR. GARTNER: That's true, and that's one of the questions that comes up later.

**DR. BATTAGLIA:** She worked there till 1965, so 5 years at Hopkins. We had made several visits out to [University of] Colorado because in doing research at Hopkins, I had a lab with André Hellegers in obstetrics during my residency, and we had a visitor on sabbatical, Paul [D.] Bruns, who got to know me. He came with us when we started to do some research at the primate center in Puerto Rico [Caribbean Primate Research Center, Unit of Comparative Medicine, University of Puerto Rico]. The reason that came about is that I had been 7 years 1-A each year with the draft, wondering, *Do they need me this year?* and going down for another physical. And Bob Cooke, I think, wanted to have a way to have me stay at Hopkins while there wasn't really a position. So he suggested—he had talked with [William F.] Windle, who was head of the primate center at Puerto Rico and who wanted to see more research come out of there. They arranged, between them, and I don't exactly know how, that I would enter the [US] Public Health Service, with a commitment to spend time at the primate center and get it rolling. so to speak. The rest of the time I would be at Hopkins doing clinical work and research.

So for 2 years, during that time—I think it was 1962 to 1964—I made trips, 4, 6, 8 weeks at a time, several times a year, to the primate center. I brought down quite a group of scientists with me, including Don Barron, Giacomo Meschia and André Hellegers, a whole group of people, and we did quite a bit of research down there in fetal physiology. At the same time, I was working with André in research at Hopkins, largely on oxygen association curves, looking at fetal oxygen affinity, because that was new in humans, and some of the studies of hemoglobinopathies, how it might affect oxygen exchange. We were doing quite a bit of work in acid-base balance and its effect on oxygen affinity of fetal blood.

We also started, almost simultaneously with Lu [Lula] Lubchenco—she knew nothing about us; we knew nothing about her—but we started looking at birth weight-gestational age distribution. I had done a study with André on teenage pregnancies, and I was very struck at that time that the work on that had been confused because people would include teenagers of 17, 18, 19 years, and they were the most frequent in the group. If you do that, the outcome looks very good in teenage pregnancy. But if you look earlier than that and eliminate this large group that do well, then we showed that there was in fact a bad outcome in teenage pregnancy.

Others had done teenage studies, but they were diluted by this large group. The issue of dilution impressed me and started us looking at birth weight-gestational age distribution. That was quite new, and I remember that Clem [Clement A.] Smith came down for a lunch meeting or something at Hopkins. He came to talk with me because he said Bob Cooke had told him that I had data showing that a lot of babies in the premie [premature] nursery were not premies. I said that was true and I showed him the data, which we published the same year as Lu, on the birth weight-gestational age distribution, with basically the same results.

That was interesting, though, because when by chance I decided to come to Colorado after Hopkins, here was Lu, and that's when we put together that grid and divided it up into AGA [appropriate for gestational age], SGA [small for gestational age] and LGA [large for gestational age]. We sat down together and said people won't use either of our reports. They won't understand it. And we needed to simplify it and make it usable for all physicians, and that's what led to our paper.

DR. GARTNER:       And we did.

DR. BATTAGLIA:    But anyway, that's a bit of the background. Now, to continue with Jane, and I realize I'm disjointed—

DR. GARTNER:       That's all right.

**DR. BATTAGLIA:** When we came to Colorado, we had our 10-month-old daughter. Jane said she wanted to be at home for a while with Susan, and then we had Tom [Thomas]. It was some years—I don't remember exactly how many—before she decided to go back into practice. When she did, she went into pediatric anesthesiology at Children's Hospital in Denver. So that's where her career took her and she stayed with that—I'm going to say she was in her mid-50s, early 50s, and decided that she had had enough of intensive care and operating rooms and such, and so she retired from practice.

And to continue with her career, we went to a concert at the Catholic seminary [St. Thomas Seminary] in Denver, and we were sitting in a pew, listening to music, and in the pew they had a sheet about a new program in theology. Now, Jane had done a lot of philosophy at Barnard [College] years ago, so she had always been interested in ethics and humanities. She had talked with a number of ethicists that we had out to visit in our home, and they had said to her, "Gee, with your background and all the philosophy you took, you ought to mix it with something in theology." So when she saw this, she enrolled and got her master's in theology degree from the Catholic seminary, something that would be impossible today because of the shift in Catholic theology with John Paul. They wouldn't have women in the seminary anymore. But our local parish priest was a classmate of Jane's, so that was interesting. Anyway, at the completion of that, she got more involved at the medical school in ethics and humanities, and has been teaching medical students, every kind of student in that program since, as a clinical faculty member.

**DR. GARTNER:** That's wonderful.

**DR. BATTAGLIA:** And she gave a course in ethics and humanities for the residents and fellows at Children's Hospital, so she's been busy in that field.

**DR. GARTNER:** That's great. So you're both still working full time?

**DR. BATTAGLIA:** Oh, no, no. Neither of us—we're both fully retired. Anything we do is volunteer.

**DR. GARTNER:** I see.

**DR. BATTAGLIA:** I'll come to what I'm doing, but she's doing teaching and enjoys it.

**DR. GARTNER:** To go on with the family, tell us about the 2 children.



**DR. BATTAGLIA:** Okay. My son is a computer programmer, and he works for the City of Boulder, as does his wife, and he enjoys it immensely. He's an addicted fly fisherman, who's now much better at it than I am, but we still go out together, and we're at the stage where he's teaching me, instead of me teaching him.

So that's nice, and they're both very happy. They live in a little town in the mountains, Nederland, with a gorgeous view of the mountains, and they commute down to Boulder.

DR. GARTNER: Do they have children?

**DR. BATTAGLIA:** No, they don't have children. And my daughter is working in landscaping. She and a friend of hers have a little landscaping business in Denver. She has a daughter, who's 22 and studying to be a teacher, and so that's the family background.

My sister lives close to us in Denver. She and Giacomo live just a few blocks away.

DR. GARTNER: That's nice.

**DR. BATTAGLIA:** She taught in the inner-city schools, high schools, for many years and retired recently. Giacomo's been retired about 5 years now, from the department of physiology at the med school.

DR. GARTNER: It's nice that you're all close by.

**DR. BATTAGLIA:** Very fortunate, very fortunate.

DR. GARTNER: Let's go back a bit. Tell me a little bit about what you remember about internship and residency in pediatrics. What was it like? What was good about it? What was bad about it?

**DR. BATTAGLIA:** Okay. There were some things that struck us. As interns, we were very impressed that only pediatrics was an integrated service at Hopkins in 1957. The rest of the services were segregated. We were thrilled by the fact that Dr. Cooke was setting up a department in 1957 with all these subspecialties, and it just showed us the fields were exploding. They were exploding, and we were just very excited about that. We were a bit shocked by the amount of pathology. There was still rampant staph pneumonia and empyema and many cases of lead intoxication and lead encephalopathy, the things that fortunately have disappeared from pediatrics.

DR. GARTNER: That was very different than what you saw at Yale.

**DR. BATTAGLIA:** Yes, we didn't see any of that. Yale was a very quiet service. The problems would be those of congenital anomalies or some infection, but, I mean, nothing like at Hopkins. It was an incredible change for us.

The second thing I was impressed with, of course, was that there were still no microchemistries, and internal medical residents would come to the lab at night, where I was working, and ask me to measure a pH. There was still not a routine measurement, and even the equipment I was using took 3 ccs of blood. You filled this glass thing with a little salt bridge, you know. So that was 1957. The rapidity of change is probably what both of us were struck with because when I returned to the residency and Jane went to complete her residency in 1960, the service was then integrated. The adult services were integrated. There was just an awful lot of change coming in pediatrics.

I feel that it was very fortunate for me to have Cooke as a chairman. He just made it easy for me as a resident to have a lab. I applied for an NIH grant and got it, and he supported me. There was no treadmill you were on, Larry. He really gave me the feeling, you know, the sky's the limit, and what you could do, you did. And it was wonderful. And, of course, people like Harry Gordon and Harold [L.] Harrison just supported that immensely, so it was a wonderful, wonderful environment for me.

I continued to have my lab in obstetrics, and all my work was very closely tied with obstetricians. It convinced me that we needed perinatal, not neonatal medicine. I really came to a strong, strong conviction in the 1960s of that. When I saw the people working in the nursery, I thought, *If you don't know what's gone on before to that baby, you're not in a good position to take care of it.*

DR. GARTNER: Henry [J.M.] Barnett, who was my chairman at Einstein [Albert Einstein College of Medicine], wanted me to take obstetric residency.

**DR. BATTAGLIA:** Really?

DR. GARTNER: After I did my pediatric residency so that I could do perinatology. I declined that opportunity.

**DR. BATTAGLIA:** He was farsighted.

DR. GARTNER: Did you ever consider that?

**DR. BATTAGLIA:** He was farsighted. No, I didn't consider that. I was too caught up in the research and what all pediatrics had to offer, you know.

DR. GARTNER: Oh, yes.

**DR. BATTAGLIA: But I was impressed that we had built a false wall between obstetrics and neonatology that has persisted.**

DR. GARTNER: You haven't been able to break that wall down here.

**DR. GARTNER: No. I'm not sure it's breakable in the U.S., with the way we fund medicine.**

DR. GARTNER: Too bad.

You've told us a fair amount about your fellowship experience, but is there anything more that you want to talk about the fellowship training experiences? You had a fairly wide range of fellowship training.

**DR. BATTAGLIA: I loved it. I've always said to my own fellows, "The fellowship years are so precious. You have no idea, because never again will you have time where learning is your critical job, and it's a unique time in your lives, unique." And it was like that for me. Philip Randle was an internist who still made rounds at Addenbrooke's [Hospital], and very kindly took me with him. Whenever it was a pediatric case, I went with him, and he invited me to be part of it. So even during that intense biochemistry training at Cambridge, I was still having some clinical contact. It was an exciting time at Cambridge because that was the year that [Frederick] Sanger got his first Nobel Prize for sequencing insulin, and then later he got it for work in showing that one gene, 2 proteins. But that was an exciting year.**

**I learned in England something that Don Barron had taught me but I hadn't appreciated the impact fully. He always said that in England, the universities understand the importance of leisure time. At Cambridge, in every department, there was a mid-morning break. Everybody came: young people, senior faculty. I could sit next to Sanger and talk with him. They didn't structure it. There were no presentations. The conversation went wherever it went. It might be science, it might be politics, it might be what we should do next with equipment. It was unstructured. But the British prized that. They felt that that led to creativity. And they did it again for high tea in the afternoon. And at the end of the day—6:30 or 7:00—every department had a pub where you went. Again, you just didn't need to plan; you knew people from biochemistry would be at that pub, having a pint, and you would talk some more. So it brought home to me what Barron stressed.**

**I took it back, so that years later, when I had fellows, I always had a coffee break in the mid-morning and in the afternoon, where they came and talked to me about anything. And I felt that it was right, and we lose it in the States frequently. Especially in clinical departments, we lose it.**

DR. GARTNER: I think that's true. We work too hard and too intensely.

**DR. BATTAGLIA: Right. But I would add that we probably work less productively because we don't have that quiet time.**

DR. GARTNER: I think the issue of discussion and having time to meet with one's colleagues—I remember some of that at Einstein, early in the years, when I was young. And it did disappear. There's no question it's important.

Did you have sort of a career plan during the time you were going through your fellowship training as to what you wanted to end up doing?

**DR. BATTAGLIA: Well, I knew I wanted academics.**

DR. GARTNER: A career in academics, right.

**DR. BATTAGLIA: And by the residency, I knew that I wanted to do it in neonatology. It wasn't a specialty per se, but I knew that's the area that interested me. Beyond that, no. The time at San Juan had given me an opportunity to meet people because [Geoffrey] Dawes' group, with Stan [L. Stanley] James and Karlis Adamson were coming—**

END OF TAPE 1, SIDE A

**DR. BATTAGLIA: You've asked me how I got to lean towards neonatology. There are a number of things. First, by all the years of research with Barron on fetal physiology, which I continued throughout—that led me to either obstetrics or neonatology. I liked pediatrics as a field. I liked my colleagues in the field. I thought it was very much an academic field, pediatrics, with a rich tradition of scientists. You couldn't work in a nursery in the fifties without realizing how many problems there were to solve. We wanted to dent mortality. There's the problem! So I think it was a combination of all those things. But it never came as a stroke out of the sky that, *Today I know I want to be a neonatologist*. It was an evolution. I think even in med school, working with Barron, there were so many neonatologists who came to his laboratory to talk with him. Millie [Mildred] Stahlman was there frequently, and Lou [Louis] Gluck. Lou Gluck was coming in the lab there, and so I think even by the end of medical school I knew I wanted that field. Now, it wasn't called neonatology, but I knew I wanted to work with newborns, and continue my contact with obstetricians.**

C. GARTNER: I just wondered if you had contact and interactions with Lou Gluck when you were at Yale.

**DR. BATTAGLIA:** Only peripherally in that he would come in to Barron's lab and I would be there, and so we would get into discussions. Dr. B never had it, you know, that someone was locked in his office. I mean, the office was always open. I had contact with Millie Stahlman and was very interested in what she was doing.

DR. GARTNER: Where was she at that time?

**DR. BATTAGLIA:** I think at Vanderbilt.

DR. GARTNER: Had Lou Gluck built the neonatal intensive care unit?

**DR. BATTAGLIA:** He was starting.

DR. GARTNER: Did that influence you? In terms of your thoughts about the field of newborn medicine or neonatology, did the construction of that unit or the idea—

**DR. BATTAGLIA:** No. I was at Hopkins for most of that, and no, it was really talking with Harry Gordon and Gerry Odell and Marv [Marvin] Cornblath, the people there that were interested in neonatology, and with the obstetricians. André Hellegers was very involved in research with me.

Now, during the time at Hopkins, Paul Bruns was professor here in obstetrics, under E. Stewart Taylor, who was chairman of the department. They had received a large grant from NIH for studies of prematurity. Paul Bruns knew me and knew what I was working on. They invited Jane and me out for 2-week blocks several times over a number of years, to help set up the lab and get projects going. During those visits, we saw Colorado and realized what a nice place this would be, and so Paul and E. Stewart Taylor invited me to come out here and join the faculty. [C.] Henry Kempe was chairman of pediatrics. Stewart Taylor was very much more influential in the school of medicine at that time. He was the senior figure. He knew Harry Gordon very well. So Stewart Taylor talked to Henry Kempe and said, "We want to bring Fred out, and he wants an appointment in pediatrics," and that's how I got to meet Henry. But the position was funded through obstetrics. The position that brought me here was in the department of obstetrics. I had a primary appointment academically in pediatrics, but the funding and the lab was in obstetrics.

DR. GARTNER: That's interesting.

**DR. BATTAGLIA:** He was a very farsighted chairman. I never ran into an OB chairman who would be willing to bring a relatively senior guy in pediatrics out, funded by them.

DR. GARTNER: It was unusual.

**DR. BATTAGLIA:** And then to make that decision because, of course, in the east everyone was saying, “You’re dead to academics if you go west.” I took time off and went up to talk with Harry Gordon, who was then at Einstein, and Harry said to me, “Fred, when I was chairman of pediatrics, Stewart Taylor and I shared an office.” The head of obstetrics and the head of pediatrics shared an office. He said, “Whatever this man tells you, you can believe him.” And he said, “It’s crazy to think that if you move west, your academic career is finished.” So we came out here, and we’ve been here ever since. We came in 1965, and we’ve been here ever since. But Harry Gordon’s advice played a big part in it.

DR. GARTNER: That’s interesting.

**DR. BATTAGLIA:** Because all our bringing up—Jane was at Barnard, Yale and Hopkins, and I was at Cornell, Yale and Hopkins, which were all private schools in the east. It was a big change to come to a state school and a state school in the west.

DR. GARTNER: Good. But you clearly liked it and have done well here. It was a good decision.

**DR. BATTAGLIA:** It was a wonderful decision.

DR. GARTNER: Tell me a little bit more about the evolution of your career here in Colorado. Let’s start with the research areas and what you’ve done in research.

**DR. BATTAGLIA:** When I came there were a lot of empty labs. It had just opened, the research bridge. We worked very hard to get a program going in perinatal physiology, largely working with sheep because we knew that that species lent itself to chronic preparations, and we had a lot of data to say that acute studies were very misleading in fetal physiology.

I continued to have an interest in clinical research. I worked with Dr. Lu [Lubchenco] on a number of studies and also began to do more work in fluid and electrolytes in newborns. We published a paper on the dangers of hyponatremia in the newborn because at that time there was an abuse of sodium bicarb [bicarbonate of soda]. People were confused about keeping the pH corrected and not worrying about what else they were doing to the baby. So we did a good bit of work in water and electrolytes.

We did work on hyponatremia in newborns, in the delivery room, by water intoxication of the mother. At that time oxytocin infusions were given in 5 percent glucose to the mother, and obstetricians would give huge amounts of

5 percent glucose, which lowered the mother's sodium and the baby's, and they came out hyponatremic. But that led us to do some studies in water transfer in pregnancy and so on, across the placenta.

The initial efforts in research were to see how much we could learn about normal fetal metabolism and nutrition and how much we could learn about placental transport in chronic animals. There was no pathology there. We were just looking at this issue. Early on, we took advantage of Colorado and did studies where we took animals that were chronically catheterized up to the top of Mount Evans, 14,000 feet, which I couldn't do today but I could do then. We had lots of fun looking at that impact on fetal oxygenation and so on.

More than anything, the early years were an extremely exciting time. I think many neonatologists, certainly Stan James and Bill [William H.] Tooley, were thinking that we were setting up perinatology. You know, it was that feeling. I don't know how to put it, but that we were probing and trying to set up a specialty that would involve understanding what happened to the baby before birth and then taking care of it in the nursery.

Now, although I had no contact with him, I must say any neonatologist of my age must give thanks to [Robert H.] Usher because he was doing what we would regard to today as kind of classic clinical research in neonatology. He was really the first to show that doing something to a baby really improves survival rate, and I think it encouraged all of us.

DR. GARTNER: That's true.

DR. BATTAGLIA: I think it said: *God, yes, there must be more things like this*. Even though he had no connection with my training or background, I think he made an important contribution at the time.

DR. GARTNER: And we do have his oral history.

DR. BATTAGLIA: Good, good.

[Recording interruption.]

DR. GARTNER: I did want to ask you about some of your colleagues here in Colorado. You talked about some of the perinatal people, obstetricians. How about some of the other people in pediatrics, people like Joe [L. Joseph] Butterfield and so forth?

DR. BATTAGLIA: When I came, Joe Butterfield was running the nursery at the university hospital, and there was—Joe [Joseph] Brazie was here as a neonatologist, and of course Lu Lubchenco. I joined them basically in

rounding on the nursery. Then sometime, a few years later—I'm not quite sure why, but Joe Butterfield moved to run a new nursery they were building at Children's. Remember, nurseries were quite new.

DR. GARTNER: Oh, yes.

DR. BATTAGLIA: Right? I mean, we were all—you were busy developing it, and there were no fixed guidelines, you know.

DR. GARTNER: No.

DR. BATTAGLIA: Anyway, Joe moved over there, and Henry Kempe asked me to take over kind of the administration of the nursery service. I was very busy attending in the nursery, but that was new. And by that time I had a good number of fellows coming, neonatal fellows, obstetrical fellows. In the early year, Elizabeth James, who runs the nursery in Missouri, was here, and Ed [Edward L.] Gresham, who set up the nursery in Indiana was here as a fellow, and Harry Bard from Montreal was here, and Charles Rosenfeld was here. And so these fellows joined me in the nursery. I remember at that time we even set up some blood pressure monitoring equipment in the animal lab so the residents could come and really understand how to do it before they were using it in the nursery. I mean, it was that kind of time, Larry. We were all trying to figure out how to keep track of blood pressure and this and that and the next thing.

Anyway, I was looking after the nursery, and Lu was attending in the level 2 and low-risk nurseries and continuing her research interests on follow-up studies, and she had her own sets of fellows. I'm trying to think now of the fellow who went off to be chairman at Dartmouth. It was one of her fellows, a tall neonatologist.

DR. GARTNER: Oh, yes. I know who you mean.

DR. BATTAGLIA: He was here, and Virginia Delaney-Black was here, and Bev [Beverly L.] Koops, so there was a whole group working with her on follow-up studies in neonatology. Then the fellows working with me were more intensive care oriented. I had—in the early group, right after Harry Bard and Maria Delivoria-Papadopoulos and that group, then there were, let's see, Gene [Eugene] Adcock and Frank Morris and Mike [Michael] Simmons and Doug [Douglas] Jones [Jr.] and Rich [Richard A.] Molteni. They actually may have overlapped. And Bob [Robert] Resnik was here in OB as a fellow. And with them, we were defining how you set up a nursery service. How do you link it with obstetrics?

Out of all that, I think a pivotal thing for me was to get a group of obstetricians, basic scientists and pediatricians together. We met in the



pediatric conference room here and put together the Perinatal Research Society. The attempt there was to get the groups talking to each other, basically; the plan was very simple. We were going to have a membership of 100: a third neonatal, a third OB and a third basic science. Of course, what happened over the years is that a number of us were faithful. We stayed for a few years and then left it, as it should have been, for younger people to come in. But many of them didn't, and so I think the thing is larger now. But it's continued; it's still going. I haven't been there, but I know from Doug Jones and others it stayed functioning.

But it was part of the attempt at that time—you know, we were all arguing: What is term?

DR. GARTNER: Right.

DR. BATTAGLIA: I remember that when we drew up our grid, I said to Lu, "You know, what's the error in estimating gestational age? Plus or minus 2 weeks. So if term is 40, by menstrual history, then you should do 38 to 42."

DR. GARTNER: Right.

DR. BATTAGLIA: Well, you know, everyone else said, "Well, 37 weeks" and so on. Lu and I talked a lot about it. We said, "You know, functionally all the time before 38 is going to be broken down into new biologic areas," which basically happened. I mean, we think 34 on, the mortality risk is very, very low. So we knew that would be compartmentalized eventually, and this was easy and direct, and so that's how it happened. But there were a lot of those kinds of discussions going on, and it was a fun time in that respect. Watson Bowes was here in OB, and he was an amazing clinician; still is. That strengthened obstetrics very much. And then Ed [Edgar] Makowski came here in OB. So there was faculty, too. It wasn't just OB fellows.

That whole fellowship program was really a big thing in defining the nursery, too, because we always wanted the fellows to have some basic research and clinical research projects so they'd learn how you prepare something for human research. They all had projects, and they took them in the nursery, looking at it a different way than just the clinical service. But there were so many things exploding at that time that just keeping up with information was challenging. All of you working in the bilirubin field were coming in with whole new ways of looking at it and challenging old ideas, which was really exciting. So that was part of it. I think Bill Tooley's group in California was doing a lot to say how much monitoring should be intensive care, and that was part of the program.

**In 1974 I was looking at chairmanships around the country, a whole bunch of them that looked interesting, and Henry Kempe stepped down. So I became an internal candidate and eventually became chair here. It was a good time for someone like me to do that. I would hate it now, but at that time, Henry still ran the department as a department. There were no subspecialties. It was a department.**

DR. GARTNER:      What year did you begin?

**DR. BATTAGLIA: 1974. I had a department retreat in the mountains, and I said to the faculty, “I think we need to really move into a much more organized scheme of the things. The chairman can’t keep track of cardiology, and I think that we need to have subspecialties and people in charge of them, and you worry about recruitment and budget for your area.” But since this was a big, big change for the department, I wanted them to feel vested in it. We did that, and I think for the most part it went well. There were times when I wondered about it [chuckles], when you had something not working well in the division, but you know those feelings, Larry.**

DR. GARTNER:      Yes. Oh, yes.

**DR. BATTAGLIA: So that was also changing. The specialties were being formed, were gelling. I mean, after neonatology came pulmonary and then came gastroenterology. They were evolving at that time. Some of them were even developing sub-boards.**

**I remember when I was president of the Society for Pediatric Research, and I gave a talk on comparative physiology, what we could learn not from any one species but looking across species to get at principles that existed, and how that would help us with human biology. At that meeting, someone asked me if I would think about having a session at the meeting that would involve adolescent pediatrics. I said, “I think that’s a good idea” and pushed for it, and it got on the program. Well, from then on, there was always an adolescent medicine section to the meeting, and eventually they became a subspecialty and all. But it was a time of change, Larry.**

DR. GARTNER:      That’s true.

**DR. BATTAGLIA: It really was, and I think, for all the chairs, made us feel some excitement.**

DR. GARTNER:      So your experience as chair was a good one. You look back on that as a very positive experience.

**DR. BATTAGLIA:** Very positive experience. There were things I felt that you could only do as a chair; you couldn't do as a division head. And I enjoyed doing them. I enjoyed doing them.

DR. GARTNER: And you stayed as chair until when? What year?

**DR. BATTAGLIA:** 1988, 14 years. Bob Cooke had told me at Hopkins that he never went to the chairman's meeting [AMSPDC: Association of Medical School Department Chairs]; he thought it was just a social club. I had heard that from a lot of other chairs, so at the time I became president for 2 years of that AMSPDC, I was determined to make it activist.

DR. GARTNER: I remember that.

**DR. BATTAGLIA:** I was determined. One of the biggest battles, without picking on anyone, was not with our chairman. They wanted the same thing I wanted, which made it so much fun, and that's how we got the pediatric scientist training program. I still remember Bob [Robert M.] Blizzard, who was then chairman at Virginia, getting up and saying, "This is such a good idea, I'm writing a personal check right now."

DR. GARTNER: I remember that meeting very well.

**DR. BATTAGLIA:** Wasn't it exciting, though?

DR. GARTNER: It was. It was great.

**DR. GARTNER:** I think because all the chairmen had the same idea at the same time, you know? Otherwise it wouldn't have flown. I said that one of the big battles was with the [American] Board [of Pediatrics] and the [American] Academy [of Pediatrics]. I said to them, "You have to come to this meeting, but you don't run the meeting. The chairmen have their agenda, but you need to hear what we're worried about." And I think they continued coming every year.

DR. GARTNER: I think so.

**DR. BATTAGLIA:** But they needed that. They needed to hear what were our issues and why, if they did this, it would conflict with us, you know? It gave AMSPDC a punch. They changed the way they looked at pediatric chairmen after that, I think.

DR. GARTNER: I think it did. It greatly strengthened the organization and the chair.

**DR. BATTAGLIA:** Right, and the chair. We had laid out an agenda that wasn't followed up, but everybody then said, "Now, we shouldn't do this only in research. What can we do together in education?" Remember?

DR. GARTNER: Yes.

**DR. BATTAGLIA:** We had planned to do that. And, "What do we do in clinical service?" That kind of got dropped, I think. I don't know. I'm not that up on AMSPDC.

DR. GARTNER: I'm not now, either. A long time.

**DR. BATTAGLIA:** But anyway, we laid out a 10-year plan for it, really, that could have kept going, Larry. You were part of that. We were all excited about it.

DR. GARTNER: Well, it was. It was an exciting time.

To go back to Denver and University of Colorado, one of the things that I recall being a major event in neonatology from here was the whole regionalization concept.

**DR. BATTAGLIA:** Yes, yes. That was Joe Butterfield's work. He was absolutely tireless in that. Joe would come and get me and say, "Fred, we're going to visit this and this and this and this nursery around the state," and off we would go. I must say he was right. I was shocked at the nurseries at that time in the state. But he did it. I mean, he really saw regional care.

Now, unfortunately, and it was not Joe's fault at all, it got destroyed by the competition between hospitals. For a while, we were getting all the small OB services closed and centralizing care. But then in came the competition, and so every hospital that had obstetrics wanted a tertiary care nursery, and it just spread all over the state, and we're no different from every other state. The whole idea of regional planning got destroyed. It is a totally absurd situation, the number of intensive care nurseries. Totally absurd. And it's true throughout the country. I mean, Boston ended up with 3 or 4 extra-corporeal oxygenators. I mean, come on now. It's just nuts.

DR. GARTNER: It doesn't make sense. I agree.

**DR. BATTAGLIA:** It was driven by money and competition. But he certainly approached it correctly at the time. We were moving in that direction, and then this came in with the financing and destroyed it.

DR. GARTNER: Right. Is that what led to the March of Dimes and the development of the levels?

**DR. BATTAGLIA:** No, it wasn't regional care. They don't have it any longer, but years ago the March of Dimes had a national clinical service committee, on which I served. They said, "If we're interested in newborns, there are 2 things we should encourage the development of: nurseries and genetic centers." And so for a period of about 5 or 6 years, communities could make a proposal: Can you help fund, give us some money to start a nursery or a regional genetics center? The March of Dimes put a lot of money into those efforts. I think they played a very important role at that time, and then it became clear that all the places should have it anyway, and we were funded and so they dropped out of that, and they stopped the clinical service committee. They moved more into an education committee, centering around nursing education and community outreach that way.

DR. GARTNER: Yes, right.

**DR. BATTAGLIA:** It wasn't really tied into regional care.

DR. GARTNER: Tell me what you believe are your major achievements.

C. GARTNER: May I ask a question?

**DR. BATTAGLIA:** Yes, sure.

C. GARTNER: To lead up to that. During the period you were chairman, were you able to continue your research in the laboratory?

**DR. BATTAGLIA:** Oh, yes. I ran an NIH [US National Institutes of Health] program project grant and RO1, and I did a lot of research during those years. I attended 3 to 5 months in the nursery, depending on how many faculty we had available. You know, the chairman always fills in the holes in the dike. But I did a lot of clinical service then, too.

I farmed out a lot of things. I mean, it was a decent-sized department, so a lot of things, I farmed out. But I still did research during that time, and had a lot of fellows. I think it was awkward for my neonatal faculty, who were running the nursery, because, I don't know, I probably forgot many times and went back into old habits. You know, I'm not sure I was always tactful because as a chairman you're so busy, and the people who come in your office are generally those you least like to see, not the scholars but the people you're fed up with.

DR. GARTNER: Those with complaints.

**DR. BATTAGLIA:** Right. Larry is very aware of all of this. But there was the element that neonatology, perinatology was continuing to develop, and it

was moving quickly, and that was very exciting, to keep up with all the changes in respiratory care and nutrition. So many things were changing in the nursery. At the same time, departments were evolving, and very quickly all the pediatric departments established their subspecialties and things. The whole nature of it was changing rapidly.

DR. GARTNER: Did you continue as head of neonatology while you were chair?

DR. BATTAGLIA: No. No. No, no.

DR. GARTNER: But you kept the fellowship program?

DR. BATTAGLIA: The fellowship program, I always was very involved in. I don't know that I can say I kept it as such, but I was very involved in the fellowship program. But the nursery—Mike Simmons was in charge of the nursery for a while, and—who else? Bill [William W.] Hay [Jr.] was in charge for a while, so there were a bunch of different people.

DR. GARTNER: Looking back, now, what do you think are your major achievements here at the University of Colorado and Children's Hospital, Denver, in research or in educational programs?

DR. BATTAGLIA: May I return to that question in a moment?

DR. GARTNER: Sure.

DR. BATTAGLIA: I'd like to finish one aspect that you raised with me at the coffee break, because it is part of development of an individual, and that was the sabbaticals.

As Jane told you and as I've mentioned, she decides the little things like where we'll live and what we'll do next year. At one point in 1978 she said we should think about a sabbatical. I wanted to do it in a non-English-speaking country. We had gone on fellowship to Cambridge, and that was very nice, but I thought we could do something different, as much for the children as for us. We'd learn culturally. And so I contacted a man whose work I always respected, Alfred Jost, who was at the Collège de France in Paris. He was very kind and said he'd love to have me come.

And so we went for a year to Paris on sabbatical. He was an incredibly nice man. Alfred Jost was a French Jew who had been hidden by friends during the Nazi occupation, really a scholar's scholar. That's the best way to put it, a scholar's scholar. At the Collège de France, there are only 7 faculty in the natural sciences, and he was one of them, and their only obligation is to give 10 public lectures each year. Jost was such a scholar that he never gave them

in his own field. He would prepare 10 public lectures in something other than developmental endocrinology. It was a pleasure to hear him. I mean, he was just such a wonderful guy.

That was a very exciting time. I learned a lot of techniques in research and had a lot of fun discussions with him. I also learned an interesting difference about the senior faculty in Europe because, remember, I was a chairman here. He saw me working on a manuscript that some of my fellows had sent me, and I was writing in red ink. I suppose the fellows hated it, but I just did it. Anyway, he saw me writing, and he asked, "What are you doing, Fred?" I said, "They sent me this manuscript. It really needs a lot more work." He said, "Fred, I don't do that." I asked, "What do you do? I can't send it out." He said, "I put the manuscript when they give it to me on my desk for 2 weeks, and then I call them in, and I give it back to them"—now, he's not looked at it. "I give it back to them. I say to them, 'This is terrible. I want it rewritten.'" He said, "I do that twice. And then it's ready on the third draft for me to read."

DR. GARTNER: [Claps hand and laughs] Clever! [Laughs]

DR. BATTAGLIA: I thought, *Isn't that European? 100 percent the European professor!* It was wonderful. Because he was a very kind, very quiet man, but he had been taught that.

DR. GARTNER: There's a lesson in there for many things. [Laughs]

DR. BATTAGLIA: Anyway, it was a wonderful year, and then we came back and plunged into things here.

My next sabbatical was after I was no longer chair, and I did a 6-month sabbatical at the University of Milan in Italy, and I did that because I had been invited to give talks at a meeting in Sicily, and there were a lot of young obstetricians and neonatologists at that meeting. Out of it a number of them from Giorgio Pardi's department came to spend a year here, and so there was a nucleus of people there who had trained with me, and so I thought it would be fun to go for 6 months and do just clinical research there. And we did it, and I had a very productive time, very productive. I think we really outlined some ideas in human biology that were fun.

DR. GARTNER: What sort of areas?

DR. BATTAGLIA: For instance, we concentrated on showing that in terms of both  $pO_2$  and  $pCO_2$ , the human placenta functions, as if it's a concurrent flow system. The umbilical vein oxygen never exceeds the maternal oxygen in the uterine vein. The best level of  $pO_2$  in the baby that it can attain is the venous drainage in the mother, not the artery, which explained why giving

the mother oxygen never hurts the baby, because the artery pO<sub>2</sub> may go up 300, 400 Torr; but the vein may increase only 4 Torr. It opened a lot of ideas for us, and we also showed at that time that the pO<sub>2</sub> gradient in IUGR [intrauterine growth restriction] pregnancies increased, which has a lot of interesting biologic meaning. But, you know, it was just a very, very exciting time.

The next sabbatical, the last one I did, was a shorter, 3-month sabbatical, and I did that at the University of Parma. I had met the neonatologist there, Giulio Bevilacqua, who was very interested in trying some nutrition research in newborns, so I went there for 3 months. In both centers, we've continued to collaborate. I still have active research collaboration with Milan and with Parma.

Now, to come back to what you said.

DR. GARTNER: What do you think of as your major achievements?

DR. BATTAGLIA: Wouldn't you say that most people you ask that of stutter and—

DR. GARTNER: Sure. [Laughs]

DR. BATTAGLIA: I'm not quite sure of "major."

DR. GARTNER: What was important? What did you do that was important, as *you* see it?

DR. BATTAGLIA: I think the work with André, showing that fetal blood oxygen affinity shifted to the left, much higher affinity than adult blood, was important work. Certainly the work on birth weight-gestational age distribution, both at Hopkins and then later with Lu here, I think changed how people were looking at babies in the nursery, and people began to sort out what problems were IUGR, what problems were preterm.

And then in the basic research, I really think it was looking at building up a case for what are the nutrients a fetus grows on—you know, what does a fetus use as its meal? In other words, the umbilical uptake, and how does it get there, and how does the mother's concentration in diet regulate what gets there? That whole area of development. So that was a big factor. We did a lot of work—as I say, at the time there were concerns among people that giving oxygen to mothers might make the fetus hypoxic by vasoconstriction, so we did a lot of work in animals to show that the placental bed is fully dilated and it does not respond to changes in pO<sub>2</sub>, so you could give oxygen to the mother safely. I think there's an important place for that.



**I think the study on hypernatremia caused by excessive sodium intake changed people's behavior. I think they cut way back on sodium bicarb treatment in newborns after that.**

**DR. GARTNER:** Yes, I think so.

**DR. BATTAGLIA:** When I say nutrition and uptake, that really took a lot of years, right?

**DR. GARTNER:** Yes.

**DR. BATTAGLIA:** Because the techniques for even measuring amino acids were atrocious at the beginning, so quite a bit of chemistry went in just to even measure uptake and show it could be done reliably in a fetus, that you could measure flow and you could measure AV differences and you could, by the Fick principle, get uptakes.

**DR. GARTNER:** These were done in sheep?

**DR. BATTAGLIA:** All the studies were done in sheep. I had sent a grant in to NIH for comparative physiology and was turned down. They had no interest in working on other species. It was too bad, because I thought there was a lot that could be learned by doing the same kinds of studies in different species.

**DR. GARTNER:** What other species did you have in mind?

**DR. BATTAGLIA:** I wanted to do the rabbit because most of a rabbit's growth is during suckling, not in utero. They're born very immature. And I wanted to do a guinea pig because almost all their growth is in utero. They don't suckle much at all after birth. So I thought those 2 extremes would be interesting to contrast, and they were small mammals, so they were polyparous species, so in every litter you had a runt, growth retarded, and a pick of the litter, a big one. You could do a lot of comparisons in the same litter. But somehow I never sold it properly, and it never got funded.

**DR. GARTNER:** And you never did any comparison.

**DR. BATTAGLIA:** I did some work on that anyway, but not as extensively as we might have done. We certainly showed that there was a great value to looking at the runt and the pick of the litter, and looking at differences in them. That certainly took a lot of time.

**And then in the last years in my work in basic research, we focused on the model of heat stress, which produces striking, really striking growth retardation and which occurs spontaneously in sheep in the summer months.**

**It was a very interesting model for us, and we've continued this—a lot of people [are] doing a lot of work on that here. I'm not as involved anymore with any of that.**

**The last 10 years have been almost fully on clinical obstetrical research, because with the advent of stable isotopes I really felt a great deal of the work we did in sheep could now be redone in the human. So we've worked on a number of projects that spin off from that. I'm trying to couple the use of stable isotopes to look at placental transport in pregnant women with techniques now that allow us to move from velocimetry measurements to blood flow measurements. We've published several papers now on umbilical blood flow measurements, and we've been working hard to look at technique to measure uterine flow with Doppler. I think that in humans we're going to be able to get uterine blood flow and umbilical blood flow measurements in pregnancy. I think stable isotopes allow us to look at transport and, to some extent, metabolism.**

**My most current focus is looking at the non-glucose trace carbohydrates in the blood, which seem to me to be pretty important and largely overlooked. So we're doing a lot of work both with stable isotopes and with just measuring concentration gradients for the polyols and for mannose and galactose and other trace sugars in the blood.**

**DR. GARTNER:** That's interesting.

**END OF TAPE 1, SIDE B**

**DR. GARTNER:** Okay. I think we were talking about some of your current research work. How much time are you spending in research now?

**DR. BATTAGLIA:** As anyone in academics, if you include time at home when you're at the computer, that's different. But I'm fully retired now, a professor emeritus, so I go in 2 or 3 mornings a week for a few hours in the morning. The young people know I'm coming then, so they get their things together, and we meet in my office with coffee, and we go over things. It's also a time when my colleagues, who still do collaborative clinical research with me, will visit because they know I'm in those days also. I just had Maciej Józwick here from Bialystok. He had been a fellow for me in a year, and he's back as a professor in Bialystok in obstetrics, and Anna Maria [Marconi] from Milan comes with several faculty at least once a year and stays here with us. You know, we do as much work over breakfast coffee as we do going into my office.

**I don't really need to be in the office. I'm not in the office very much, but I still feel pretty active. It's just fun.**

DR. GARTNER: That's wonderful. Great that you keep it up. In terms of your major achievements in other areas such as education, certainly the fellowship program for pediatricians was a very major one.

**DR. BATTAGLIA:** That wasn't my contribution. I feel they gave me too much credit there because there was a wonderful committee of people who talked out over many, many sessions how to set this up, and they really all deserve a lot of credit. You know, when we started that committee we had no travel money, so pediatricians all came at their own expense, and everyone plunged in. Again, it was a feeling this program was needed, you know. But that wasn't my contribution, by any means.

DR. GARTNER: Other areas?

**DR. BATTAGLIA:** In the education area, I have to say my best teaching was in small groups on rounds. I made teaching rounds for many, many, many years in the nursery, and the fellows would all come, and the residents and they'd present whatever cases they wanted. It would lead us into discussions of pediatrics, where it needed to go, where were the limits of our knowledge, where were we guessing what to do [both chuckle], because I always felt you're really a good doctor if you know the limits of your ignorance.

DR. GARTNER: Yes.

**DR. BATTAGLIA:** And respect it. But I did teaching there.

I did put into our residency here on an academic track which has continued to this day. Those residents who knew they wanted to go on in fellowship and academics were encouraged to set up some research projects with faculty in the department, and they were given some time off from other things so they had a little more time for that, and that's continued. They were a group that always got notices if we had a special lecturer in, that kind of thing. Now, I know the department has continued that academic track.

DR. GARTNER: How many at any one time? How many of the residents?

**DR. BATTAGLIA:** I would say usually, like, 25 to 30 percent of the residents would choose that.

DR. GARTNER: Did they get a shorter clinical residency period, or did they do the full 3 years?

**DR. BATTAGLIA:** No, no. At that time when I started it, there was discouragement for shortening programs, so they did the full 3 years. Now,

**I'm not sure if they're doing that now. I'm not up on that. But all the time I was chair and for the early years, when I first left, I know that it was 3 years.**

DR. GARTNER: And that was your feeling, that they should have the full 3 years.

**DR. BATTAGLIA: Yes.**

DR. GARTNER: I share that with you.

**DR. BATTAGLIA: I think that the residency should not be as tightly structured as the RRC [Residency Review Committee] required. I don't believe in that. And the reason I'm very much against it is that I think chairmen should be free to arrange residency training, taking maximum advantage of the strengths of their settings, and that varies from school to school.**

DR. GARTNER: Yes, it does.

**DR. BATTAGLIA: And if you have an absolutely superb group in endocrinology, residents will learn a lot beyond endocrinology by having contact with those people, so I think the chairs should be given much more latitude than is permitted today, with so many weeks here, so many weeks there. I understand what drove it, which was abuse where a service requirement in the hospital mandated the residents doing more time in neonatology than somewhere else, but that could have been corrected without structuring it this tightly. It's too tightly structured now.**

DR. GARTNER: Right.

**DR. BATTAGLIA: If you loosen that up, you get rid of the pressure to have 2-year instead of 3-year training because residents, during their 3 years, could do research if they chose. And so I've not been a fan of that. I understand how it came about, but I think it was a mistake.**

DR. GARTNER: Yes. Good point. Who would you consider your role models? We talked a lot about people you trained with, but whom do you look back on as real role models for your career?

**DR. BATTAGLIA: Bob Cooke certainly was a big, big role model for me. His commitment to research and academics, the way he built that department, the encouragement he gave young people was really very, very impressive, and certainly he's a role model. Harry Gordon was a role model to me. I always felt that Dr. Gordon was bigger than neonatology. He had such a broad vision of pediatrics and was so scholarly in how he had that vision. I still remember when he decided to be an ombudsman for patients at**

**Einstein. That was typical Harry. He was definitely way ahead of the time. And Don Barron, with whom I trained, and Phil Randle. Both played important roles in my life.**

**Then there were people who were colleagues who taught me a great deal, André Hellegers and Giacomo Meschia, in different ways. André set up the Kennedy Institute of Ethics at Georgetown [University] and brought in an incredible array of scholars in every kind of discipline involving religion and ethics and humanities. He just was a very, very clear thinker in that field, and I don't think OB/GYN has had anyone like him since. Really, it was a tremendous loss when he died at a young age. And, of course, Giacomo. You can't work closely for 40 years with someone without learning an awful lot.**

DR. GARTNER: Good. You've got a great many honors over the years, awards, honorary degrees, things of that sort. Do you want to talk a little bit about some of those and what they mean to you?

**DR. BATTAGLIA: Honestly, without false modesty, I always was amazed when I got something. I mean, truthfully. You know, it's easy for me to see other people out there who deserved recognition, and many of them didn't get it. That's the funny thing about awards, you know. You see so many who deserved it but didn't get it. I think also it's a matter of longevity. You know, you live long enough to get them; some of these awards you don't get when you're young. You know, Larry.**

DR. GARTNER: It's true.

**DR. BATTAGLIA: So if you die young, you won't get the [John] Howland Award, for example, okay? But I've always really felt very close to the colleagues in pediatrics. And when you get an award, it only strengthens that feeling. You feel, *My goodness, this is so nice of them to do that.* You know.**

DR. GARTNER: True.

**DR. BATTAGLIA: I don't want to be critical of anyone here, but I found that between being president of the SPR [Society for Pediatric Research] and years later being president of the APS [American Pediatric Society], I found a striking change in how the meetings were run. Now, I understand why it had to become so bureaucratic, but when I was president of the SPR, which I think was somewhere in the late 1960s, the presidents of the 2 societies, SPR and APS, really planned that program. They really did. That's how I could put in an adolescent medicine section. When I came back as president of APS, it was all done by a huge, huge committee, and the meeting was huge, and you really didn't feel you had any role in it at all. No, honestly. You really felt you didn't have any role in it at all.**

**One thing that I look on as a great positive now is the fact that the APS had a dinner for all its members, the Howland Dinner. And I think that was really needed, to give the APS identity. I pushed for it when I was president. I didn't get it then, but 1 or 2 presidents later, we got it, and I think that's a nice affair. I think people like to see their friends and talk with them.**

DR. GARTNER: It's a great social occasion, no question. I've often thought, myself, that the times I liked best at the APS/SPR meetings were when we only had plenary sessions and we were all together in the room in Atlantic City and we heard the whole thing. And now we go, and it's all divided up—

**DR. BATTAGLIA: It's become impossible to do that.**

DR. GARTNER: That's right, you can't do that, no. And the plenaries no longer exist, really, as plenary sessions.

**DR. BATTAGLIA: Now, the awards that surprised me a good bit were the awards from the Academy, in getting their Nutrition Award and their teaching award [Professional Education Award], because, you know, everyone—there are 24 hours in a day, and I wasn't that involved with the Academy. Not that I didn't wish the Academy well, but, you know, I was doing other things, and so I hadn't been that involved with them. And I really appreciated it that the people in the Academy recognized something in that way, and that was a big surprise, big surprise to me.**

DR. GARTNER: Good. You've been president of 3 of the major pediatric societies. Anything about that role that you want to mention?

**DR. BATTAGLIA: I still think it needs to go a long way to make things more open. I think that the way the meetings are structured lends itself to a rather short and poorly attended business meeting. We need a new way to get meaningful input from all the membership, and I don't feel we've achieved that yet. Again, it's not faulting anyone, but I think that those societies should be very, very open in how they operate and what they do with money and how they assign things. I think that the societies have to be careful not to be caught up in fashions. There should be some old coots like me, older people involved in this so that they could keep perspective. You shouldn't have every new awardee be someone doing molecular biology when there are so many important things to address in clinical research and other areas that involve direct patient contact, so that's the only comment I might make. But I also respect that it's an enormous meeting now. And so it needs a lot of bureaucracy to have it run.**

DR. GARTNER: I think it's amazing it runs as well as it does. They are huge meetings, no question.

**DR. BATTAGLIA:** The failure is not pediatrics. The failure is internal medicine. But we've never succeeded in working with the internists, even at the regional level. At the Western Society [for Pediatric Research] we made every effort to work with the internists, and it always got rebuffed. I think it was to the disadvantage of both groups.

DR. GARTNER: How did you see that working together working? What did you mean by working together?

**DR. BATTAGLIA:** I think it should really mean that pediatricians—for instance, at the WSPR [Western Society for Pediatric Research]—are involved meaningfully in choosing the program in metabolism, and not always have the whole program for internists on diabetes. It's crazy. There just needs to be more of this kind of interaction. Pediatrics tried, but we haven't succeeded.

DR. GARTNER: That's an interesting point. That's a challenge for the future.

**DR. BATTAGLIA:** Yes. Plenty of challenges out there.

DR. GARTNER: We're moving into the area of general pediatrics, and I did want to talk a little about pediatrics in general, not neonatology but pediatrics in general. You've been in pediatrics now 50 years or more. How do you see the changes that have occurred in pediatrics? That's a broad area, and obviously there are educational issues, clinical issues, training, research, but what do you see over that period of time that's changed and evolved?

**DR. BATTAGLIA:** Okay. Boy, you ask broad questions, Larry.

DR. GARTNER: I want them to be open ended.

**DR. BATTAGLIA:** I'm going to interpret it first looking at the practice of pediatrics by practicing pediatricians. There, I think that the trend towards more inclusion of ambulatory pediatric issues and adolescent medicine issues into training is a big and good step forward, and the people who pushed for it, like Bob [Robert J.] Haggerty and Joel [J.] Alpert and others should be commended for that. I think it needed to be done. I think it could have been done without restricting chairs quite so much in how the residency time is used, but certainly the goal was a good one.

**In the practice of pediatrics, unfortunately I think that there has been a lot of change that was driven by the way it's financed, in the kinds of groups you're in, how many patients are scheduled to be seen in a day. [There was] far too much pressure, I think, for pediatricians to continue to take care of problems when it really needed referral to a specialist, and I think this is just**

part of the climate in medicine generally, because my experience with internal medicine shows that the same thing is going on there. They don't like to turn it over to a subspecialist, even when it's needed.

I'm concerned about that. I'm concerned how this is all going to shake out. Pediatrics, like every area of medicine, is blocked from doing what it needs for children by the fact that we have no national health program in this country. It's desperately needed. It's been needed for 10 years. And until that happens, there'll never be really good health care provided to all children in the country. That's not a problem of pediatrics, but it does impact pediatric care, and I think that's a big thing.

DR. GARTNER: Do you think we will get a national comprehensive health care program?

DR. BATTAGLIA: Yes, I think so. It will come. I don't know the time scale, but it's got to come, and it will come.

In pediatrics as it relates to departments of pediatrics, I think that there has to be more attention by the chairs to having some part of their department meetings or retreats or whatever that is focused on academic issues and not hospital service issues. It's become such that a good part of the people coming to those meetings are not faculty; they're hospital people in one role or another. I'm not sure how to do that, but I think the first thing is to be aware it is a problem, and I hope that AMSPDC and the Academy and other groups will think about this, because it is not good the way it is right now. Remember that during our chairmanships, all schools moved to some kind of faculty practice fund and incentive-driven reimbursement.

DR. GARTNER: Yes.

DR. BATTAGLIA: Now, that was needed, but at the same time, what happened with that is too much accounting of your time. That isn't destructive to a full professor because they pay no attention to it, but [for] the assistant professor, getting a printout each month of how much they billed and how much they collected and all this kind of stuff puts a pressure on them that you and I did not have.

I think there are many examples of that. The fact that medical record is now a billing record changes how they operate, so I think departments need to look at that. They need to look at it, because I do believe that if you don't allow time for thinking in the university, the society is in big trouble. We're perilously close to that, you know. By that, I don't mean that a cardiologist doesn't think, but he shouldn't only be thinking, he or she, with other cardiologists. For the sake of pediatrics, there has to be some thinking that



**cuts across these subspecialties and I don't see that going on very much today.**

DR. GARTNER: That's a good observation.

I want to ask you about Children's Hospital management and sort of the running of Children's Hospital. Every medical center now has a children's hospital, and they're often run not by pediatricians but by business people. How do you feel about that?

**DR. BATTAGLIA: I think that that is not a big problem if the pediatrician is the clinical chief. If there's one clinical chief and it's a pediatrician, and where there's a university, that pediatrician is also chairman of the department, I think that they can easily work with the business person. In general, the bureaucracies in hospitals are out of control, as you know, so it's not so much the chief person but this array of people under them that I think drains a lot of time and a lot of money and could be thinned out considerably. But the chief of the hospital, the CEO of the hospital—I think that is not the problem.**

**Children's hospitals are impacted, as every hospital, with the absence of a national health program, and so they're forced into the dilemma of trying to restrict indigent care, which is really against what they should be doing, which is to take care of all the children that need it. But it has helped because you get specialized services for children. That is the good side of it. And where it hurts, for instance, in our field, neonatology, how do you link up with obstetrics? And where is that nursery? We know that biologically the nursery belongs right by the delivery room. Children's hospitals often preclude that, and that arrangement is bad. For us, that is a problem, but it needn't be that way. It's just the way things tend to get structured. They shouldn't be structured that way, but they do tend to get structured that way.**

DR. GARTNER: I've always had the dream of a women's and children's hospital,—

**DR. BATTAGLIA: Oh, yes, that's the way it should be.**

DR. GARTNER: —as the ideal, and I don't know of any place that's achieved that.

**DR. BATTAGLIA: No.**

DR. GARTNER: Unfortunately.

Would you advise a young medical student now to go into pediatrics?

**DR. BATTAGLIA:** Oh, sure. I still think it's far and away the most exciting part of clinical medicine because children have such a potential to recover from illness. We're learning that so many of the adult diseases start in childhood, and so you could really make a difference to the person's long-term quality of life by addressing issues in childhood years. There are a lot of challenges, social challenges in society that impact on children and need further study, and I'm not just talking of TV violence but the whole way families are structured and behave. I think that's really an important area of research, so there's so much there, so much to do.

And pediatrics needs to forge closer research links with education. Let me give you an example. We're learning that children at 6 months of age already lose the recognition of sounds that are not used in the language they're growing up in. In other words, they're growing up in Japan, they lose "r" and "l" distinction, and they do it by 6 months of age. Children who speak languages, such as the Slavic languages, that use the biggest variety of sounds, have a big advantage later in learning foreign languages. They haven't eradicated distinctions that we have in English. I think those kinds of things could lead to more research about how—you know, when do we start other languages, how do we encourage other languages? In Europe you can turn on a TV and hear German, French, Italian, whatever. You can't do that here. The only thing you might hear is some Spanish, but that's it. So pediatrics should have more interaction in areas that deal with how children learn and so on.

Pediatrics has a lot of challenges. The fashionable one today is growth hormone for small children. Now, it's easy for us to say, "Don't give growth hormone to a child who's not ill just because they're small." But despite all the talk about it, the fact is in school they are bullied terribly, and their lives are made miserable if they're small, and it's still going on, whether it's a private or public school, so there is a big incentive to have children big. That's just an example where we need research. We need some thought, and I don't mean research on whether we give growth hormone or what growth hormone. We also need research that says: How should schools be structured? These so-called courses they're giving about bullying don't work. And we need other ways of doing this. And pediatrics should be in the forefront of that kind of research.

**DR. GARTNER:** There's probably less of that now than there was years ago when pediatricians were more involved.

**DR. BATTAGLIA:** Right, right.

**DR. GARTNER:** Interesting. Good point.

How about specialties? Would you advise young people, young pediatricians to go into neonatology and other subspecialty areas?

**DR. BATTAGLIA:** Well, it's easy for me to say yes because I see all the questions in neonatology that still need answering, particularly as it relates to CNS [central nervous system] injury, but certainly all of the fields are going to be impacted by new knowledge: proteomics. I think that we haven't even touched research on mitochondrial disease. There, the genetics is quantitative, not like Mendelian, so it's a whole new field, and it needs study, and it'll apply to the lung, to the GI [system], to every area. So I couldn't push one area over another, although I certainly think that neonatology presents no shortage of challenges.

DR. GARTNER: Right. So it's still a good field for young people to enter into.

Okay. What I want to do now is talk about neonatology in a broad perspective, and we've really entered into beginning to talk about that, not limited to your own career but on a broader base. You talked a little bit about when neonatology began and how it had its origins. When do you think neonatology or the recognition of newborn medicine as a specialty, either the need for it or the actuality of it, occurred?

**DR. BATTAGLIA:** In academic areas, I would say in the late 1950s, early 1960s we began to recognize the need for attention focused on the newborn and the nursery and the kinds of nurseries that should be built. It progressed very rapidly in the 1960s and was virtually complete, for the most part, by 1970. Then in the 1970s came the whole thing of outreach and what it could mean, the potential it could have, so I think that was really the beginnings. I feel that, despite all the discussions, there is no perinatal medicine in this country. I think that's a fair statement. I've not seen a service where I could say truthfully, "There's perinatal medicine going on here." Everyone wants it, but—

DR. GARTNER: It hasn't happened.

**DR. BATTAGLIA:** It hasn't happened.

DR. GARTNER: How about in other countries? Is there a model in Europe, for instance, for perinatal medicine?

**DR. BATTAGLIA:** I'm not that familiar with countries in Europe. As I've seen it, at least, I haven't seen it done that much better there. I would say that my impression is that obstetrics is done much better there than in the States. Because they do have regional care, much more attention to offering a full gamut of obstetrical services and seeing to it that it's provided than we

**have in the States. But that's largely because of the national health program. They can plan more regional care there, and the obstetrical services that are high risk truly do develop a lot of the techniques that are required.**

DR. GARTNER: Right now there's been an enormous shift in the people going into obstetrics, and it's predominantly women at the present time. How do you think that will change obstetrics in the future, particularly the perinatal issues?

**DR. BATTAGLIA: I don't know. I think for women as patients, it's a very good change. Many women wanted to have a woman physician, and I think that change is good. But I don't see them being especially attuned to perinatal medicine. I don't think that's an issue that gender is going to make very much difference. And the pressures on obstetrics are largely driven by issues of how it's funded in med schools and in the community, and so I don't think it's going to have much impact that way.**

DR. GARTNER: We talked a little bit about the development of neonatology as a discipline, as a separate subspecialty. What do you think was driving that movement to becoming a separate subspecialty?

**DR. BATTAGLIA: I think largely it was the fact that we had more and more we could offer that made a real difference to survival rates and morbidity rates, and so there was a pressure to see to it that we didn't overlook offering all the advances to children, and that required the kind of knowledge a neonatologist had. When I started, the nurseries would get wiped out. Eighteen out of 24 babies would die from some infection, you know.**

DR. GARTNER: Right.

**DR. BATTAGLIA: And now there's so much you can do for the babies, and I think as that came along, the pressure to have people who saw to it that that service offered everything was greater. That's why I think that the lack of perinatal services is bad, because we don't have that pressure to develop the medical links, service links between obstetrics and pediatrics that we should have.**

DR. GARTNER: What do you think might be done to foster more of a perinatal orientation to neonatology and obstetrics? What would propel that?

**DR. BATTAGLIA: I think if you took obstetrics, just obstetrics, high-risk obstetrics and neonatology and put their budgets together and their clinical learnings together, you would change it overnight. Now, the 2 chairmen of the 2 departments would fight that like crazy, but if you want to achieve something for patients, that's the way you would achieve it.**

DR. GARTNER: Essentially make that a separate department.

**DR. BATTAGLIA: Separate functioning group.**

DR. GARTNER: I had once suggested actually to Harold Schulman, who was then chairman of OB at Einstein, that we develop a residency in obstetrics only, not gynecology, and neonatology only and that we train people only in essentially perinatal medicine.

**DR. BATTAGLIA: Right.**

DR. GARTNER: He thought that was a very good idea, and we talked at length about doing that, as a concept. Somebody pointed out that nobody would take that residency because when they got older, what would they do? These are 2 tough areas to work in.

**DR. BATTAGLIA: And boards.**

DR. BATTAGLIA: There would have to be a new board.

**DR. BATTAGLIA: Yes, yes.**

DR. GARTNER: They would have to have a different board. That was the easier part of it, but the development of interest in it and people when they got older and burned out, the obstetricians become gynecologists, and the neonatologists—so I'm not sure. That's a question I can ask: Do you think neonatologists do burn out?

**DR. BATTAGLIA: Oh, yes.**

DR. GARTNER: Then what do they do?

**DR. BATTAGLIA: What I did is stop doing intensive care, so the first years after stopping intensive care, I was rounding in level 2 and level 1 nurseries, and still did teaching rounds, where we discussed where the field is going, but I don't know. I think a lot of neonatologists do that, and they move into more administrative work, as you've seen happen.**

DR. GARTNER: I did both of those, and I think that is true. I think fewer have burned out than I expected. There are some who have done it for many, many years, continue to do intensive care, much to my surprise.

**DR. BATTAGLIA: I know what happens to reflexes and to stamina at 2:00 a.m., and I don't believe that's really safe.**

DR. GARTNER: I agree with you.

What do you think the role of pediatric surgery has been in neonatology? What's their contribution been?

**DR. BATTAGLIA:** At their best, they've added a really important dimension and have helped children a lot, especially those with congenital anomalies but also others. At their worst, they've been a disaster. You know. So I do feel that the pediatric surgeons I worked with here were good. They were people that understood where we were coming from, and I understood where they were coming from. I thought they were gentle and careful with tissues and so on. There still needs to be a lot of research in that area. I think that we haven't touched the potential of neonatal tissues to remodel, and we've got to look at ways to encourage that, because I think it can be done. But for the most part, I think they've been reasonably careful.

DR. GARTNER: Have they been colleagues, neonatologists?

**DR. BATTAGLIA:** Yes

DR. GARTNER: Have you seen that here or elsewhere?

**DR. BATTAGLIA:** I felt that the pediatric surgeon here was a colleague. I think that there were a number of them who were not. That made it more difficult, but they might say the same thing.

DR. GARTNER: [Laughs] I guess so.

How did neonatology get its name, "neonatology"?

**DR. BATTAGLIA:** I'm very bad at that kind of history, and I don't honestly know that. Perinatology—you know, we had discussions: what should it be? And "peri" ("around the time of") seemed appropriate. But neonatology—the newborn nursery probably led to [the] neonatal nursery. I don't know.

DR. GARTNER: I don't know. I've asked that question of everybody in the series. Nobody has actually been able to answer the question.

**DR. BATTAGLIA:** You do some historical work, and you'll get it.

DR. GARTNER: It suddenly came up, and we all accepted it, but where it came from is unclear. Now, neonatology was born out of the premie nurseries and premature infant care and textbooks about premature care. What's your view of this? You touched on it a little bit, about Hopkins and the premie nursery at Hopkins. What do you think about that movement, that evolution from—

**DR. BATTAGLIA:** From premature nursery to neonatal intensive care?

**DR. GARTNER:** [cross-talk; inaudible] what we have called the neonatal intensive care unit.

**DR. BATTAGLIA:** I think it was—

END OF TAPE 2, SIDE A

**DR. GARTNER:** We were talking about the transition.

**DR. BATTAGLIA:** I think you would agree that it was more a natural evolution. At the time the premie nurseries existed, their primary focus was avoiding aspiration pneumonias from milk feedings, and infection. And those were the things wiping the children out. It took advances that said, yes, doing things to these babies really increased survival, and that led to more manipulation of the baby. And [William A.] Silverman's work and others—it wasn't just Silverman, people in Britain and so on, who were looking at maintaining body temperature and improving survival. [Robert] Usher's work in maintaining hydration and improving survival, and [Marvin] Cornblath's work on hypoglycemia and the need to prevent it. All of these were small steps that were saying, yes, we can do more to the baby, safely, safely, and it improved survival.

Now, there were other changes going on in pediatrics that impacted neonatology tremendously. First of all, microchemistries. When I came out here, Donough O'Brien had set up a microchemistry lab. We had none at Hopkins. And I was just amazed in 1965 to see that you could take a little [inaudible] stick of blood, and he could do all these measurements on it. I mean, I think it was the first in the country doing that, or among the first, among the first. So that improved things.

The nurse who designed the first butterfly for IVs. You know, she made them herself. She broke off the fat part of a stainless steel needle and put it on tubing and got all fixed so that it worked. I think people have no idea how much all of these mechanical changes made a difference.

**DR. GARTNER:** Right.

**DR. BATTAGLIA:** For example, in 1957 to treat children with dehydration, on the wards, not the nursery—no one would start an IV in a nursery—we had, at every major hospital, deaths from babies drowning because you had a big open glass funnel, and you poured the solution in the top. There was no careful regulation, and so if the needle changed the resistance—[makes whssssh sound]—too much went in. Under those conditions, who would start

**an IV in the nursery? Gradually we came to these plastic packs and small tubing and pumps that pump at low rates. It wasn't a neonatal advance, but it made neonatology possible.**

DR. GARTNER: Right. True.

**DR. BATTAGLIA: And I think that when you say, "Well, how did we progress?" it was through all these steps. It wasn't just respirator care; it wasn't just temperature regulation; it was everything else that made manipulation of the baby a safe thing to contemplate.**

DR. GARTNER: The nurse example with the IV was a good example of practical experimentation that went on in the nurseries, out of necessity. And I remember fooling around with respirator equipment, literally going to anesthesiology and going through their junk piles, finding pieces to put together to do CPAP, to do ventilator care.

**DR. BATTAGLIA: You could give it much better than I, but you know that the centers that did not have a neonatologist specifically interested in bilirubin, what the bilirubin measurement was like.**

DR. GARTNER: Right.

**DR. BATTAGLIA: My God! So this was certainly part of the change.**

DR. GARTNER: You were at Hopkins, I guess—let's see, you must have been there when? I guess in the early 1960s, when the transition occurred from a premie unit of the old type to an intensive care unit.

**DR. BATTAGLIA: Yes, yes.**

DR. GARTNER: Tell me about that. What do you recall of how that transition came about?

**DR. BATTAGLIA: It wasn't so smooth and carefully thought out.**

DR. GARTNER: No.

**DR. BATTAGLIA: When [Louis K.] Diamond showed exchange transfusions worked, that was a big impetus, too, because you had to do exchange transfusions, and that involved a lot of manipulation.**

DR. GARTNER: Right.

**DR. BATTAGLIA: And you needed a setup for it, and that certainly spurred development of intensive care in the nursery. So it was coming from**



that; it was coming from the need to give IV fluids to smaller babies, and recognition that it could be done safely. There wasn't any one person doing that. Gerry [Gerald B.] Odell was involved, and Mel [Mary Ellen] Avery was involved, and a number of us were attending, working in the nurseries, but it all came about gradually.

And against this, you have to keep the backdrop that it wasn't until quite a number of years later that the first human research committees were set up, because I went to testify to the National Academy of Sciences, when they were interested. "Do you need a human research committee for neonatal research and OB research?" Well, I mean, it's obvious today, right?

DR. GARTNER: Right.

DR. BATTAGLIA: But at that time, it wasn't obvious, you know?

DR. GARTNER: It's true.

DR. BATTAGLIA: Yes. So I don't know if I'm answering, but I think these were little steps, little steps. Different people pushed the envelope in different ways. There's no question that Silverman and the Canadian, John C. Sinclair, who worked with Silverman, were at the forefront.

DR. GARTNER: Yes.

DR. BATTAGLIA: Anyway, they were concentrating on thermal regulation and insensible water losses and things like that. Other people, like Bill [William H.] Tooley, were looking more at cardiovascular: what was a normal blood pressure, and how do you assess the circulation. So everyone was bringing different things to the table, and all of us incorporated most of it.

DR. GARTNER: I guess what I'm asking you is who pushed for it at Hopkins? How did that change occur? At Einstein I can mark the moment when it occurred, because it occurred in one moment when it changed from a premie unit to a neonatal intensive care. It was the moment I brought an infant of a diabetic, a great big 9-pounder, into the premie unit with the head nurse screaming at me that this baby didn't belong in that nursery and that there was a premature—so it was literally that moment.

DR. BATTAGLIA: Really.

DR. GARTNER: And I just wondered, did a similar transition occur at Hopkins?

**DR. BATTAGLIA:** I don't know, because at that time, I wasn't involved in any administration of the nursery, and so those battles were going on behind the scene. I think Gerry Odell was the primary pusher of the nursery. Mel worked there, Saul [Brusilow] worked there, but the primary person was probably Gerry Odell in terms of the changes that went on there. I don't think it came out of any one thing, though. At least at Hopkins, I think a large part of it came from the exchange transfusion pressure that was big at that time.

DR. GARTNER: As you talk about exchange transfusion, an image came back to me. We used to do all the exchange transfusions in the delivery room when I was a resident.

**DR. BATTAGLIA:** No, we had a separate room for it at Hopkins.

DR. GARTNER: In the 1960s?

**DR. BATTAGLIA:** In the 1960s, yes.

DR. GARTNER: Earlier, when I was a medical student and a resident, which would have been 1957, 1958, 1959—

**DR. BATTAGLIA:** Oh, that might very well have been done in the delivery room. Oh, yes.

DR. GARTNER: My memory is that we did it all in the delivery room.

**DR. BATTAGLIA:** Yes, the 1950s, definitely. Right.

DR. GARTNER: That's interesting.

**DR. BATTAGLIA:** Right. Oh, yes, it was interesting.

DR. GARTNER: We've come a long way.

**DR. BATTAGLIA:** My goodness.

DR. GARTNER: [Chuckles] Okay.

I think we've really talked probably a lot about this. I just wondered if there's any other sort of major clinical advances that have occurred in neonatology that we haven't talked about. You mentioned a number of them just now.

**DR. BATTAGLIA:** Well, of course, there were many recent advances. I mean, all of the work with surfactant and surfactant treatment, and that was preceded by work that was needed and how you decided that a baby was not

ready at birth. That was important because then you knew whom to treat with surfactant when it became available, so those were all important studies.

I think issues on nutrition became more important, particularly for the very low birth weight babies, extremely small infants. The whole field of IUGR [intrauterine growth restriction], because, you know, at the time it first started, we were thinking of babies between 34 weeks till 40 weeks, who were small. And now we recognize that problem at 26 weeks, so it's opened up this whole new arena of pathology and the problems they have. That's been really important.

What else? I think the areas of research—and it's really come from different aspects of it but that have looked at germinal matrix hemorrhage, reducing the incidence, and how you treat it when it does occur. More on the prevention. That's been important research.

Certainly the work on the diabetic infant was crucial. I think that was probably the first good example of what I called transient birth defects. By that I mean you get, for instance, septal hypertrophy and myocardiopathy that causes a lot of problems in the newborn but gradually disappear as the baby grows, so they're not a problem at 1 year of age. You can still show this septal thickening, but functionally they're not a problem.

DR. GARTNER: Right.

DR. BATTAGLIA: And the same thing with the islet cell hyperplasia. I mean, it causes hypoglycemia in the newborn, but then by 6, 8 months of age, it's not a problem.

Now, the interesting question, and I think it's still wide open, is what does that dysmorphic growth in utero that produces these, quote, "transient birth defects"—what does it do to adult life? That is being heavily investigated today, to look at that. So those were important advances. I think they led us to look at biology and anomalies differently, you know. We realized they didn't have to be anomalies right at organogenesis but during fetal life. I think that was nice work.

DR. GARTNER: There are a few areas we haven't talked about in neonatology that certainly dominated or have taken a lot of time of neonatologists. Drug addiction, maternal transfer of drug addiction to newborns.

DR. BATTAGLIA: Well, it is an important area, and I am sure I have left out many different areas in the discussion thus far, but we had some overreaction in that field, no question about it. You know, the pictures and distortion about the crack babies. I mean, a lot of that was terribly blown up. There are problems with that. There are more problems, I think, with

**alcohol abuse and fetal alcohol syndrome, which unfortunately still occurs, but even there, there was kind of an overreaction in the sense that women became frightened to have any alcohol intake in the pregnancy, and there was really no evidence that that was such a risk. But how do you deal with the binge drinker, the alcoholic binge drinker, who has great difficulty stopping this? And that hasn't been solved yet. It's still a problem.**

**Will there be new drugs that we find affect the baby and cause problems? Undoubtedly. We have to keep our eyes, ears open and our suspicions high. And there, always, you need someone who keeps thinking of assessing the advances in chemistry. You know, we need someone focusing on, "Gee, the things we can do now with HPLC [high performance liquid chromatography]. What does that open up in terms of finding out about problems in babies?"**

**DR. GARTNER:** Right.

**DR. BATTAGLIA:** We've seen it used already, extensively, in pharmacokinetics in the newborn, but there's plenty of room for more advance there. The research is by no means complete on what can be absorbed through the skin, in the lung, and not just the GI tract, so how we give medicines might be altered.

**DR. GARTNER:** How about nutrition? We talk about changes that have occurred in the feeding of premies and newborns.

**DR. BATTAGLIA:** My goodness, the array of formulas that have been adapted are very high-quality formulas, both in Europe and this country, for feeding very premature babies or supplementing feedings, are just wonderful, and I think the companies for the most part have been very good in taking the latest advances that make sense and introducing them in formulas,—

**DR. GARTNER:** Right.

**DR. BATTAGLIA:** —so the way we construct the protein intake, the whey-curd ratio and looking at ensuring the intake of even the semi-essential amino acids, the intake of polyunsaturated fats and how carbohydrates—I think the new research that's interesting, involving the oligosaccharides that seem to be not digested in the small bowel but go into the colon and determine a benign bowel flora. That's important work, and we're going to see more of that kind of work go on.

**Then how you provide the nutrition: how much should be peripheral and how much should be intake through milk and how do you make the transition? This is all very exciting.**

DR. GARTNER: We now have movement toward more human milk feeding, or breast feeding, or breast milk feeding, particularly in prematures and smaller, sick babies.

**DR. BATTAGLIA: I think that that's a trend that needs a lot more research. We need to know more about the milk we're collecting from that particular woman and what its composition is, but the advantage of having some of the caloric intake as human breast milk is that it respects our area of ignorance. There are so many compounds in breast milk. We still don't understand what they are there for, and they're not there in formulas, and so it seems to me a safe thing to do while we learn, while we learn. I think it's a trend. Now, unfortunately, sometimes that gets linked with having low caloric intake, and that, I think, has to be examined very carefully.**

DR. GARTNER: Yes. Good point.

Are there any major deficiencies—you just mentioned one—other major deficiencies in clinical neonatology that you see as urgent, that need urgent attention?

**DR. BATTAGLIA: My goodness. Remember, you're talking to someone retired.**

DR. GARTNER: That's all right. [Laughs]

**DR. BATTAGLIA: Generally those questions are better answered when you're on the front line, but I will say that I feel that we've not used the paradoppler enough in the nursery. It is extremely good at sizing up flow in small vessels and telling us if there's a problem with the circulation to one or another organ, and we are not using that enough. Secondly, most neonatologists virtually do not use at all the huge array of information about the baby's circulation that was collected before delivery, on all of the different fetal vessels that are examined. I think that's a mistake. So those are things that come to mind immediately.**

DR. GARTNER: Good ideas.

[Recording interruption.]

DR. GARTNER: All right, we're back on. Where were we? Let's see. I have a question here about—but I think you answered it—major research achievements in neonatology in general. I think we talked about a lot of that. Are there any that you didn't talk about?

**DR. BATTAGLIA:** Oh, I'm sure, but I think in recent years, the most striking has been around pulmonary disease and the use of surfactant and how to use it and in what children. I think that's been really the biggest thing. We're getting close to big breakthroughs in terms of CNS disease, but we're not there yet.

DR. GARTNER: Right. What do you think about the pushing back of the gestational age frontier? How far back do you think we really can go, and what are the limitations on that?

**DR. BATTAGLIA:** I think we're really at a point where we should think seriously before we go trying to push further, honestly. I think we ought to find ways to solve the problems of the CNS handicapped in babies from 25 weeks to 32 weeks first before we worry about trying to increase survival rate in a 23- or 24-weeker. That's my own feeling. I think that from a societal point of view, it doesn't make much sense to spend effort and money in that area.

DR. GARTNER: Do you think from society's perspective we're spending too much now on neonatology? It is expensive.

**DR. BATTAGLIA:** I think that we're certainly spending too much. The question is why, and I think it comes down to 2 different things, one a legitimate, in a sense, expense, which is the efforts people make on babies below, let's say, 27 weeks down to about 25 weeks. I personally think that there'll be a tendency to not push quite so hard on some of these babies that, as we get more information, really had trouble in utero, and it doesn't make sense to try to salvage the situation after birth.

DR. GARTNER: Right.

**DR. BATTAGLIA:** So my guess is there'll be less efforts spent on that in the future. At least I hope so. The second area is just people maximizing income. Many babies are kept far too long coded as intensive care who are really level 2. That abuse is difficult to stop in our system. Those are probably 2 areas where costs are more than they should be.

DR. GARTNER: Right. Interesting challenge for the future.

We didn't talk about ethical issues in the nursery as one of the areas where I think there have been major changes and major learning in that area. What do you think about that? Life and death decisions.

**DR. BATTAGLIA:** I think that there has been learning, and I think there's been more attention paid to this. And, as in most areas of medicine where we advance, we also regress. I mean, there are pluses and minuses to this area.

DR. GARTNER: Sure.

**DR. BATTAGLIA:** The attention paid on looking at long-term quality of life in making decisions, recognizing that some babies are dying and we should treat them as we do all dying patients, with a great deal of respect and minimizing pain and discomfort. All of those changes are very good and should be fortified, I think. Keeping parents better informed, a more open communication with them has been a very good thing. I think, though, that in some instances we go too far in the degree of patient autonomy, to the point where we relinquish our important role as physicians of minimizing suffering by a family, that there are times when we don't recognize: this family really wants some advice and some guidance, and we're not giving them. I think the pendulum has gone a little too far that way at times. But in general, the move is in the right direction.

Issues of social justice have not been really properly addressed in neonatology or in medicine generally, and that's a problem because it affects so much of what we do and how we take care of patients, and those issues are big ones. Maybe it will be addressed in years ahead. I think it's linked with how we take care of all of our people. [Chuckles softly] So far, we haven't addressed it.

DR. GARTNER: No.

**DR. BATTAGLIA:** Those issues of social justice are still a problem.

DR. GARTNER: And certainly true.

**DR. BATTAGLIA:** Informing and keeping open a discussion, I think, has been a good move. I do think a lot of the problems with parents and their interaction with doctors around intensive care may come a little bit from our not making clear to parents the limitations of what we can do. You know, if you don't make that clear, there's a tendency to look at intensive care and think we can handle anything.

DR. GARTNER: Right.

**DR. BATTAGLIA:** Young people in training often overlook cumulative risk, Larry. If you break an arm bone, you fully expect to survive. If you break both arms, you fully expect to survive. Now, when you start breaking both arms, all your ribs and both legs, I'm not sure you should be so happy because the orthopod will say, "I can fix this bone," and another orthopod, that bone, but there's a cumulative risk.

DR. GARTNER: It's true.

**DR. BATTAGLIA:** And the data show the mortality goes up.

DR. GARTNER: That's right.

**DR. BATTAGLIA:** So even though each problem can be addressed, when they're all in the same patient, the risk goes up, and in neonatology that's frequently the problem.

DR. GARTNER: Very good point.

**DR. BATTAGLIA:** We get a baby who starts out with this problem, respiratory distress, and then develops necrotizing enterocolitis and then develops some other problem and then a fourth problem, and finally you say, *Have I ever seen a baby with all these problems survive?* If the answer is no, then you're dealing with a dying patient.

DR. GARTNER: That's true. I've also noted, years ago, that having a sick baby in the neonatal intensive care unit was an enormously traumatic event for the family. And I'm not sure we've dealt with that. I don't know what your feelings have been about that.

**DR. BATTAGLIA:** No, no, I don't.

DR. GARTNER: Divorce and psychological trauma for the family are often the result of having a small, sick premie.

**DR. BATTAGLIA:** I don't think we have addressed that. The other thing linked with that is that I think doctors too often rush in to discuss concerns the parents don't have.

DR. GARTNER: Right. That's right.

**DR. BATTAGLIA:** That we ought to give them time to talk, and we'll see what they're worried about.

DR. GARTNER: I think that's very true. We often don't hear what they're saying.

**DR. BATTAGLIA:** Right. [Laughs]

DR. GARTNER: Or they're afraid to say it.

**DR. BATTAGLIA:** Yes.

DR. GARTNER: Quite so.



Let's talk a little bit more about training of neonatologists, particularly training in research, which you've spent a lot of your thoughts and efforts on. I thought you might talk a little bit about the evolution of that, of how we train researchers in neonatology and how have we done?

**DR. BATTAGLIA:** In general, I think it's been quite successful. I think that we've had people come along younger than us that have taken up the mantle. In general, I think it's gone well. Where there are problems, I think it can come in 2 arenas. First, the research faculty have enormous pressures on them, both at the department level and school level, for grant funding. Grants have been poorly funded. I mean, NIH has spent far too much of its budget on other things rather than RO1 grants, and so a lot of their money gets frittered away in other programs. Secondly, there hasn't been enough basic funding of NIH. But the long and the short of it is, it's made it very competitive for faculty to go after a grant, and in the pressure to look at their grant productivity and, at the same time, to look at their clinical service and its earnings and so on, the fellows' training can be overlooked. They can be almost drift into being another technician.

What fellows need for their training may not always be what the faculty members needs for the weekly progress report. To give you a few examples, I think that if you're doing research in molecular biology in some area, which most of the neonatal investigators today are doing, that laboratory might be quite distant from a patient. And as a person learns an area of research, it's easy for him to lose sight of all the other potential areas which in fact he may be much more suited to than his mentor. The mentor may be very uncomfortable going to recruit patients for clinical research, and would much rather get some tissue and do something with it. But this particular fellow may be better suited for—

I feel like you need to have him involved in some clinical bedside research as well as whatever basic project is near and dear to the heart of the mentor. The same mentor probably cannot help him in the clinical research arena, and senior faculty, in my experience, have been loath to recognize their limitations, to—I don't know, if you're working on the lung, to say, "Gee, I really don't know how to do research clinically like that, and maybe you should go work with So-and-so for the clinical study and continue to work with me on something in surfactant protein genetics in my lab." But I mean anyone, anyone working in a focal area maybe has difficulty saying, "Now, that's not my thing," and give them help to work in another area. Generally they don't think of encouraging them to set up a project that involves obstetrics, even though we've said perinatal is important and we should know they don't get involved in it.

**But I think the biggest thing, though, is this business of the mentor, or whoever it is, having the time to get off the treadmill, to stop traveling this week, to stay at home and have a cup of coffee with your fellows and talk, you know?**

DR. GARTNER: Yes.

**DR. BATTAGLIA: I don't see that getting done among the young senior faculty, "young" meaning 55 to 60. I don't see that getting done much in the people around me. I think that it's very focused on productivity, so you work with me on what defends my grant, and we all work together and have money for that, but to get them looking more broadly is—and to think of that person, that fellow's areas of strength, which may not be in your areas of strength.**

DR. GARTNER: Right. I've certainly had fellows who were not interested in bilirubin. [Laughs]

It's true. But how about the opportunities for fellows to get their own starter grants, to get started in the grant area? There are grants to these people. How successful are they?

**DR. BATTAGLIA: I thought that those grants, if you look at them, are mostly for people at the instructor or first- or second-year assistant professor level, not for post-doc fellows. Are there some for post-docs? I may be uninformed.**

DR. GARTNER: I'm not sure. I know there are some grants for—

**DR. BATTAGLIA: Starter grants for young people.**

DR. GARTNER: Whether they're in fellowship—I thought it started sort of at the end of fellowship.

**DR. BATTAGLIA: Oh, that could be.**

DR. GARTNER: I don't know.

**DR. BATTAGLIA: That could be. I think they're all very good programs.**

DR. GARTNER: Are there enough of them? Do we need more?

**DR. BATTAGLIA: There are not enough. There are not enough RO1 grants, okay? There's too much of big grants for networks or for this goal or that goal. I think there should be more investigator-originated creative work, RO1s, not something the NIH staff decides is a focus. I don't think**

there's enough, and it's certainly not enough for young faculty starting out. Again, this is something that the departments should plan. They should build up funds to help young people initially.

DR. GARTNER: Through philanthropy?

**DR. BATTAGLIA:** Or diverting part of their clinical income. Here, for example we are allowed to take 90 percent of our bonus home or we can take 50 percent home and leave 50 for research, academic activity. I think that could add up to a lot of money in big departments and can help young faculty get started.

DR. GARTNER: That's interesting. Hmm! How much supervised, mentored research training do neonatologists need? Fellowship and some continuation of mentored, supervised research training? Three years is what you get sort of officially in your fellowship, of which a year or year and a half is clinical. How much do they need?

**DR. BATTAGLIA:** I would say that the fourth year added on is a very productive time for them and would help them be in a much stronger position for starter grants. So the way things are going today, I would say a fourth year, where they're an instructor in the department, so they have some responsibilities but not as much as they will get when they leave and go as assistant professor somewhere. I think that's a very useful year. The reason I say that is as instructors they will do some attending, not much but a little bit; they will do some teaching, so it's kind of a phasing in, not having it all hit them as an assistant professor.

DR. GARTNER: I agree.

C. GARTNER: Okay, I think I need to change tapes.

DR. GARTNER: Okay, we might stop a minute.

[Recording interruption.]

**DR. BATTAGLIA:** The danger of an approach that's too narrow, it seems to me, is you tend subconsciously to disregard the knowledge that has already accumulated, as unimportant, which means you have to relearn some awful lessons again, whatever the areas. If you allow a baby to develop severe hypernatremia today, that baby will be just as dead as 20 years ago, so you have to not lose knowledge as you try to get new information, using new techniques. I don't know how that's going to be taught to fellows today, because most of the people who are training fellows today were not trained in any understanding of physiology and interaction of organs and so on. Systems biology was not part of their training. But some of the young people

going through today—their real contributions, the ones that are suited to their interests and talent, would come in that area. And I don't think they're getting training that helps them develop those skills. Now, for those whose skills lie in molecular or cell biology, they're getting very well trained today, and they'll make wonderful contributions. But what about the fellows whose skills lie in other areas? That is going to take some thought, and I think neonatologists will come to recognize it and try to address it in one way or another, but it is a current challenge.

DR. GARTNER: There are certain areas where research is certainly needed, whether it's on ethics issues, social issues,—

**DR. BATTAGLIA: Epidemiology.**

DR. GARTNER: Epidemiology, biostatistics.

**DR. BATTAGLIA: I mean, look how we got rid of Reye's disease by an observation about aspirin. So I agree. And I think—**

DR. GARTNER: But you think that now fellowship training is too much focused on the molecular biology.

**DR. BATTAGLIA: Well, not just molecular biology; it's focused on the mentor's grant.**

DR. GARTNER: Yes. Right.

**DR. BATTAGLIA: It's defense of the grant, in a sense, and that's a problem.**

DR. GARTNER: That's a problem. I agree. There certainly are issues about whether all fellows in neonatology should undergo research training, or should we be training some fellows as clinicians or clinician teachers and not require them to do research training of any kind?

**DR. BATTAGLIA: I think that they should all have some research training. First of all, if you're a subspecialist, you're either going to be connected with a university or at a major hospital, and it seems to me that you should at least understand the potential of research, and if you're working in a major hospital or at a university service, even if *you're* not going to do research, you should know how to make it possible for others to do research and facilitate the whole thing and not be an obstructionist. I think if you train people only as clinical neonatologists, you're going to build a lot of obstructionists to research.**

DR. GARTNER: Valid point. I agree.

A significant number of the fellows that we all trained and trained in research end up become full-time clinical neonatologists, often at community hospitals, level 3 or level 2. How do you feel about that?

**DR. BATTAGLIA:** I don't think we wasted their time or our resources. The ones I know who've gone off have kept a strong teaching commitment and commitment to stay current in neonatology. I don't think they'd have had quite that strength of conviction without the research training and being involved in an academic environment. I think their service is different because they have that.

DR. GARTNER: How do you feel about the economic and health care delivery issues in American medicine as they relate to neonatology?

**DR. BATTAGLIA:** I told you I feel really sad about this. I think that the way medicine has come to be structured has totally defeated regional care in perinatal medicine, so all the hospitals in Colorado now have intensive care nurseries because they wanted to keep obstetrics, and many of those hospitals should not have kept their obstetrics and should not have developed neonatal nurseries, but this is going on throughout the country, throughout the country. It's not the way care should be developed. I think it's against quality care to have no regional planning, and that's a big problem, and it's very expensive. Now, can that be changed without a national health program? I don't think so personally. I'm a committed believer that we need a national health program.

DR. GARTNER: In a way, we who were trainers in neonatology have contributed to the ability of these multiple neonatal intensive care units to exist because we have trained so many neonatologists, as boarded neonatologists. Did we over-train? Have we been training too many? Should we have trained fewer neonatologists?

**DR. BATTAGLIA:** I don't know. I would say that if you had regional care, you'd have bigger services but fewer of them, and you'd need doctors on those bigger services. I'm not so convinced we've over-trained.

END OF TAPE 2, SIDE B

DR. GARTNER: This is Tape 3, Side A.

**DR. BATTAGLIA:** I think most of the problem has not been over-training high-risk obstetricians or neonatologists. I think most of the problems stem from hospitals, for financial reasons, making a decision that they wanted to keep obstetrical services largely to maintain their GYN service, and therefore they needed a nursery, and the obstetricians wanted to go to high-risk OB.

**That meant the nursery had to become tertiary care, and so gradually any regional planning went down the drain. I think that was the biggest problem.**

DR. GARTNER: Are neonatology or neonatology services generally a big money maker for hospitals? Half of all the net profit for the entire University of Chicago hospitals came from the neonatal intensive care unit.

**DR. BATTAGLIA: They are.**

DR. GARTNER: Big money maker.

**DR. BATTAGLIA: Big money maker. And that means that they're overcharging for neonatal intensive care quite a bit, and undercharging, probably, in some other areas. I think that that has driven a lot of the decision making. It has. You asked earlier, in an ideal world, whether I feel that you should rearrange obstetrics and neonatology to be together, and I absolutely agreed with you. I think you feel that way.**

DR. GARTNER: Yes, I do.

**DR. BATTAGLIA: I absolutely agree. But the reason it isn't, in large part, is that neonatal supports the pediatrics department.**

DR. GARTNER: Right. Absolutely.

**DR. BATTAGLIA: And it's still true to this day.**

DR. GARTNER: Yes, it is.

**DR. BATTAGLIA: It is still true to this day.**

DR. GARTNER: Let's change a little bit of the topic and let's talk about individuals in the field of neonatology, and you've actually mentioned a large number of people who have contributed significantly to the field in their research and their writing, and their teaching. Are there any that really stand out as major, major figures that we haven't talked about?

**DR. BATTAGLIA: Oh, yes. I mean, I'm scared stiff I'm going to leave out so many people [who] should be in. Leonard [B.] Strang was a major figure in England and certainly really was a giant in a lot of ways to the field, and there were a whole group of Swedish neonatologists in respiratory disease that made big contributions.**

**In this country, I mean, I'd have to go state by state to not forget people, but I've already mentioned Millie Stahlman and Tooley and Stan [L. Stanley]**

**James.** There was a younger generation than me that are making major contributions. I think [Eduardo] Bancalari is certainly a leading figure, and Alan [H.] Job and—you know, there's just a slew of them that really are contributing in both research and in training of fellows, influencing people through their training programs. Yes.

DR. GARTNER: Let me go back to sort of an earlier generation. You spent time in France. People like Alex [Alexandre] Minkowski and—

**DR. BATTAGLIA:** Oh, yes. Alex was a bigger-than-life character, you know.

DR. GARTNER: Yes.

**DR. BATTAGLIA:** Alex walked in a room, and everybody saw only Alex. He wrote books, *The Barefoot Doctor*, [*Le Mandarin aux Pied Nus*] remember?

DR. GARTNER: Yes.

**DR. BATTAGLIA:** But Alex had a tremendous influence in Europe. France mostly, but in Europe, and contributed a lot. The neonatologist in Holland, who ran the nutrition conferences and who trained a lot of people who are now chairing departments there, was a key figure. Nils Ryha in Finland was doing a lot of work, and in England Robert Boyd and the fellow, Hull, David Hull, who worked on lipid transporting across the placenta, and Leonard Strang we already mentioned.

DR. GARTNER: Yes.

**DR. BATTAGLIA:** But there were just lots of people that—I mean, my goodness, it's difficult to keep them all in line here, but in this country, I think I've touched a lot of them.

DR. GARTNER: I think so.

**DR. BATTAGLIA:** There are people whose contributions were less in research and more in developing guidelines of current neonatal care. Av [Avroy] Fanaroff is an example. I think his contributions are more in what is neonatal care. Many of the neonatologists played a very important role in the Academy. Joe [L. Joseph] Butterfield, you mentioned. Jim [James A.] Lemons at Indiana was very active and think he still is in the Academy.

DR. GARTNER: Yes.

**DR. BATTAGLIA:** So there are people who contributed in that arena. Charles Rosenfeld has made a lot of contributions. Now, as a neonatologist, he's probably one of the few who really has focused his research more on obstetric-related research than neonatal-related research. Of course, Lou [Louis] Gluck. I mean, he's passed on, but he was a major figure in neonatology.

**DR. GARTNER:** Was Lou's creation of the Yale ICU, neonatal ICU really a turning point in development of neonatology as a discipline?

**DR. BATTAGLIA:** Personally I didn't feel that. I thought that Lou's contributions were around assessing maturity of the lung before birth, and that he was really one of the first in that field. Now, the nursery, because it was peculiar to his interests, most people didn't copy that setup. You know, the big open room with everything hanging down was so noisy, so disruptive—

**DR. GARTNER:** I agree.

**DR. BATTAGLIA:** —people couldn't work there very long, and so it wasn't adopted at other centers very much.

**DR. GARTNER:** But did he come up with the idea of intensive care?

**DR. BATTAGLIA:** Oh, no.

**DR. GARTNER:** Who started that movement?

**DR. BATTAGLIA:** That wasn't a movement from any one individual. That would be a mistake to say that. You know, everybody was contributing in lots of little ways: Usher's work on hydration; Tooley's, on the circulation; people working on temperature; people working on bilirubin who said, "Hey, you need to get this analysis done correctly and frequently"; the work we did with looking at [a] refractometer to estimate urine osmolality and track water and electrolytes. All of this was going on simultaneously, and so I don't think you could ever point to any one individual and say, "Gee, he set up intensive care." I really don't. It's not taking from Lou. I just don't think anyone did it. I mean, Stan James was working on aspects of it, you know.

**DR. BATTAGLIA:** That's true.

What about major textbooks and their contribution? What are the major writings in neonatology, and what did they contribute?



**DR. BATTAGLIA:** Okay. I separate that. Clem Smith's book [*Physiology of the Newborn Infant*], which was written basically by Clem Smith, played a very important role in the early years of neonatology. Now, a lot of it was misinformation, okay, but he was presenting *a* viewpoint. The books that followed, for me, were really a big disappointment. People fell into "let me be *the* editor and round up 50 people, each to write a chapter," and the books lost any sense of cohesion. Books like that take so long to get out that by the time they are out, they're already out of date, so I found them not very useful, and I didn't recommend that they be used by fellows other than trying for a board exam. But they weren't useful, and it didn't matter whose book you looked at; they were all the same. They all had some editor who corralled people in 50 areas to write. They do that for so-called expertise, but the cost of that is it never reads like a British textbook. It never is a book you enjoy sitting down and reading.

And of course the need for such textbooks got wiped out by the computers and the Internet. I mean, if you need information on something, you go to the Internet, you don't go pull out somebody's textbook. When it just comes out, it's already 4 years out of date.

DR. GARTNER: That's right. How about some of the very early textbooks, say Bill Silverman's on the premature [*Dunham's Premature Infants*] or the first [Marshall H.] Klaus-Fanaroff book [*Care of the High-risk Neonate*]?

**DR. BATTAGLIA:** I never used any of those.

DR. GARTNER: None of those were useful?

**DR. BATTAGLIA:** I never used them personally, because, you know, you were talking to colleagues enough. You knew their ideas and their approaches, and some of it you agreed with and some you didn't. I'm just talking personally; I just didn't find any very useful.

DR. GARTNER: This is your perspective.

**DR. BATTAGLIA:** I always felt that the fellows should look at what they needed to know and then go in and dig it out of the literature.

DR. GARTNER: What have *you* written? I mean, you've written many articles, hundreds of articles for the medical literature about books and contributions.

**DR. BATTAGLIA:** I didn't do much with that. I wrote a few little books. Probably the one that I spent the most effort on was a little learning text on the placenta and placental transport, which Giacomo [Meschia] and I wrote [*Introduction to Fetal Physiology*]. We did that many years ago, and I know

**all our fellows were helped by that. It really took things in a very simple way, explaining fetal physiology developed and so on. We've often talked of a second edition, but we haven't done it. It's a great deal of work to write something from cover to cover. But probably texts like that are going to continue to be very useful to people because it's not the kind of thing you can get from the literature. You'll never see it in one of these multi-author texts. And since we dealt with physiology and organ function, there are very few places that you can go to learn that today.**

DR. GARTNER: Your advice to the younger generation of neonatologists would be, "Don't write a big textbook on neonatology."

**DR. BATTAGLIA: Unless they do it, as most of them do, for financial reasons. They do it for financial reasons. If you hit a big seller, you make a lot of money, and that's what people hope. And it's done all the time in neonatology and in high-risk obstetrics, but I just think it's not very useful today.**

DR. GARTNER: I don't know whether you've seen Alistair Philip's new article, "The evolution of neonatology," in this month's *Pediatric Research* [2005; 58:799-815]. It's quite long. And, you know, it's good. It's interesting. In it, he has a section on errors in neonatology, and he lists all of the mistakes that have been made. I just wondered what your thoughts were about mistakes that have been made.

**DR. BATTAGLIA: Well, I don't know his list. But I can tell you that when Silverman used to give his talks with the list of errors, I always pointed out at his talk that most of those, I never made on my service because coming from training in Barron's lab in physiology, a lot of these things never made sense to me. You know, pouring in bicarb [sodium bicarbonate], for example, never made sense to me, and the use of an antibiotic generally in the nursery when you didn't even have disease never made sense to me, so there are a lot of these things that I think were avoidable by some common sense. Now, I don't know the list, so maybe there are some things on there that we all did.**

DR. GARTNER: Clinical mistakes in formula preparation.

**DR. BATTAGLIA: Oh, errors like that. Preparing an infusion correctly in the pharmacy. That is going to happen, and despite all the checks and balances, you will find that every check and balance is defeated, and the kid still gets too much potassium or whatever it is. Those errors are going to continue, unfortunately.**

DR. GARTNER: He's talking about systematic errors.

**DR. BATTAGLIA:** I was thinking more of when you consciously decide to do something to the patient.

DR. GARTNER: Right. Or drugs that were on the market that really weren't adequately tested and then it turns out they were harmful.

**DR. BATTAGLIA:** Right. Now, chloramphenicol, I was lucky because a good friend of mine, Ghislaine Godenne, was doing research on chloramphenicol in infants and showed you got up to toxic levels very quickly. Then one of my first fellows here, Bob [Robert] Peterson, who later became a chairman in Canada, was very interested in pharmacology and set up early systems of HPLC to look at drug dosages for some of the drugs we were using in newborns and, again, showed the very delayed excretion of premies that indicated that we really need different dosage. This was even before what's his name [Jacob] Aranda, who was doing a lot of the work later and confirmed it. So that alerted people, I think. But there will be new drugs, and there will be a learning curve to them. Some of the side effects will only be picked up after a while, I mean, so that's going to continue.

DR. GARTNER: What do you think about the movement, which is not just in neonatology but in general, of developing more formalized paths or protocols for clinical management?

**DR. BATTAGLIA:** Yes. I've always felt that protocols are not good for dogs and children and other living creatures. I don't like those paths. It's been used in oncology, and they will tell you how much they've advanced by using these protocols, and there's no question they have. But it's very difficult for them to quantify how many kids have been hurt by the protocols and how much extra manipulation was done to a child that didn't need it because it was part of a protocol. So in general, if we're talking patient care, I don't like the protocols.

DR. GARTNER: You don't think a protocol allows one to then systematically measure the outcomes of that management.

**DR. BATTAGLIA:** Okay. If you have as a goal a clinical research project, of course it's acceptable to have a protocol for that study, and I agree with it. I thought you meant that we're going to have a protocol for hyaline membrane disease. Nobody's doing research on it, but we're going to do this way—

DR. GARTNER: That is what I meant.

**DR. BATTAGLIA:** That, I am against.

DR. GARTNER: [Laughs]

**DR. BATTAGLIA:** Yes. That, I am against.

DR. GARTNER: Even if it's based on the latest research.

**DR. BATTAGLIA:** When I served with the board and 10 of you tried to decide what is the right way, you'd have 10 answers, so the idea that there's one answer—

DR. GARTNER: Okay.

**DR. BATTAGLIA:** Okay? And there's certainly not one patient. The more we learn about genetics, the more we realize there's not one patient. So I think it's a dangerous way to go.

**I guess I like anything in medicine that encourages doctors to think. I really believe that there's a place in medicine for thinking, and I'm not saying that as grandstanding. I really believe that sometimes what the patient needs most is for the doctor to think about her case, not react. And that's very hard to get people to do in an intensive care setting.**

DR. GARTNER: That's right.

**DR. BATTAGLIA:** Very hard. But, you know, I think it's needed. Protocols don't encourage that.

DR. GARTNER: That's true.

What are your views about the participation of parents in neonatal care? Some of it is decision making and sharing; that's one aspect. But also the issue of actual physical participation in the care. There's been a movement toward parents playing more of a role in the direct care of their children. So it's both: decision making and physical care.

**DR. BATTAGLIA:** I don't see things that are bad about that. I think that you will always, when you open that door, you will have some people come along where you will regret that. They may be having problems and so their interaction with the staff becomes terribly disruptive, or they may be fulfilling not a healthy need but a sick need.

DR. GARTNER: Right.

**DR. BATTAGLIA:** But in general I think that that is a good thing. In general I think they can add a dimension that is good for them when they take the child home from the hospital, at any age, and I think that nurses and doctors can learn from the parents. Parents tend to be very, very observant

**about their own children, and I always felt that when I went in to talk to a mother after a normal-term delivery, she always found something on the baby I missed. You know, “What about that bump on the soft palate?” I didn’t even see it. So I don’t think that would be bad; I just think that you have to do it, understanding that there will be times when you will regret it. But most of the time it will have a positive effect. It makes for a much smoother transition on the baby.**

**DR. GARTNER:** Martin Couney, the one who ran the side shows at the world’s fairs and on Coney Island, found that his biggest problem was getting the parents to come and take their babies home, the premies, after they grew up. I don’t think we have that problem.

What are your views about the roles of nurse practitioners and other specialized nursing people in neonatal intensive care units? They’ve become much more important players in neonatology.

**DR. BATTAGLIA:** Oh, they have a lot to offer. There’s no question that’s been a boon in developing services. Now, you obviously have to have some guidelines, but I think in general that’s been a worthwhile trend in all of medicine. I don’t know of major problems that have stemmed from that.

**DR. GARTNER:** Some people have been concerned that it may diminish the role of the resident or the fellow because these people are so technically capable. Do you think that’s a problem?

**DR. BATTAGLIA:** That’s a risk, but I think it can be handled. I think that we can look at that and these people can be aware of the needs of the residents for education and training. So I think it’s a danger, but it’s not one that I see as being diametrically opposed to good residency training. I think it’s one that takes some sensitivity, and the problems can be solved.

I’m a little concerned with another area of residency training that I don’t think is impacted so much by the nurse specialists. As fellows and faculty have been in the nursery more, driven in large part by economics—they have to be there and sign things to bill, so they’re around more—the residents are not given the responsibilities they had in the past, the decision making. There is no question that a PL-3 [Pediatric Level 3] finishing today has not made many of the kinds of decisions and dealt with them directly that they did 20 years ago. There’s just no question about that.

Now, here is where I see this coming up. For instance, a mother is a drug addict, and she delivers a baby, and the social workers decide that the baby should be taken from the mother. There’s not enough input from physicians about this, about their assessment of: Is this mother a good mother, and is she a loving mother, and does she want to take care of this baby? They kind

of relinquish this decision making to a group that have their own way of looking at things, and it may not be right for the child or the mother.

The same thing has happened because, when you and I started, if there was a need for a coagulation consult from hematology. They came with us and talked with us and decided what should be done jointly. Now, for efficiency and billing, hematology makes hematology rounds, and they sweep through the pediatrics service, the wards, etc., with their entourage, who are not going to disagree with them about anything. So I see a problem there. The residents are not seeing a senior hematologist and a senior pulmonologist arguing with a senior neonatologist about what is right for this baby. And residents learned a lot from those discussions.

DR. GARTNER: Oh, yes. It's true.

**DR. BATTAGLIA:** Now each service makes its own subspecialty rounds, and it's efficient. It saves a lot of time, but you lose a lot from that, and I think that's impacting the fellows' training and the residents' training.

DR. GARTNER: I wasn't aware of that, because I haven't been in that for a while. That's an interesting problem. I guess in a related way, on the other side of the coin, what about the role of the primary care pediatrician in neonatal intensive care or neonatology? Where does he come in?

**DR. BATTAGLIA:** They've almost been cut out completely from the loop, and that will only get stronger in the years ahead because our residents end up with less and less neonatal training. They're less and less qualified to take care of a level 2 baby, let alone level 3. I think it will be fine if the general practitioners could keep up their skills to really handle term deliveries and emergencies in a delivery room. I'm not sure that they will do that in the years ahead.

DR. GARTNER: I think that's also going the way of the hospitalist.

**DR. BATTAGLIA:** Right. But if they have a role, it's in that level, not level 2, not level 3.

DR. GARTNER: How about in terms of follow up, the role of the generalist? We as neonatologists finish our in-hospital care, and then the question is: Who follows up on the baby after discharge?

**DR. BATTAGLIA:** That is age related. If you talk about babies 34 weeks and above, I think the general pediatrician can do a fine job follow up on it. Below 34 weeks, I think that they need to follow the family, but there should also be a neonatal follow-up.

DR. GARTNER: Specialized. Why do you think we need that kind of specialized follow-up for these babies?

**DR. BATTAGLIA: I don't think the pediatrician is in tune to or trained, even, to pick out the problems early that those kids may develop.**

DR. GARTNER: How about training for assessment of outcomes for neonatologists, fellows and even residents? Is the follow-up clinic an important place for that training?

**DR. BATTAGLIA: Absolutely.**

DR. GARTNER: I always thought so.

**DR. BATTAGLIA: At least in Colorado it's a difficult thing to find. It's a very big cost operation. It doesn't get anywhere close to generating income to support itself, so the issue of how you support it—but it's needed. It should be a teaching and training base, as well as a service base, absolutely.**

DR. GARTNER: And it can be a good research base.

**DR. BATTAGLIA: Absolutely.**

DR. GARTNER: Let's see, you talked about ethics. Talk a little bit about the future of neonatology. You touched on some of this. What do you think neonatology is going to be like 20 years from now? Will it look at all like anything we know?

**DR. BATTAGLIA: Yes, I think some of the problems will still be there. I think there's going to be prematurity. We're not going to lick it in the next 20 years. And I think there will be a need for respiratory care that spins off from prematurity. There certainly will be a lot more focus on CNS development and on both nutrition and genetics, for guidelines for families. Hopefully, intensive care level 3 can diminish if we don't start this push to go earlier and earlier in gestation. Hopefully there will be more careful decision about which 25-, 26-weekers we make an effort with. So I don't think intensive care will be quite as much a focus. More level 2.**

DR. GARTNER: I must say if I was asked that question 10 years ago, I probably would have said that things like liquid ventilation would have been a reality, that we would have technologies that were so advanced that our whole way of managing respiratory problems for extreme prematurity would be quite different, and it hasn't happened yet.

**DR. BATTAGLIA: No.**

DR. GARTNER: Do you think, still, that we're going to have technologies that will be so radical?

**DR. BATTAGLIA: I don't think they'll be necessary if we don't go much beyond 26 weeks early, because I think we'll have ways to help the lung adapt quickly. We'll learn how to stimulate lung development, not just with steroids but with other kinds of things. I think that the care of the baby from 26 weeks on will get, in some ways, more natural, relying on the baby to develop a response appropriately. A lot more focus will be on how we get tissues to remodel and to heal quickly, which is part of knowing better the genetic background and the nutritional support.**

DR. GARTNER: Right. So you don't think we're going to get to the neonatal intensive care unit that's going to have artificial placentas.

**DR. BATTAGLIA: I certainly hope not. I certainly hope society has more sense than that.**

DR. GARTNER: Where would you put resources in the future in neonatology? Would you put it into preventive measures?

**DR. BATTAGLIA: Right. Also focusing better on using new tools in diagnosis, whether it's mitochondrial genetics, whether it's in Doppler analysis of the circulation, using tools like that to spot problems earlier and take care of them. But certainly knowing the history. The amount of data that we collect in my own research on a high-risk patient. If neonatologists get in the habit of understanding that information, knowing how to interpret it and use it, I think it will make a great difference in neonatal care.**

I'm sorry, I'm losing my voice. Could we take a break? I'll get some water.

DR. GARTNER: Yes, sure.

**DR. BATTAGLIA: Thank you.**

[Recording interruption.]

**DR. BATTAGLIA: You asked me about neonatology and where it's going. One of the things we haven't talked about is the potential for cell replacement, stem cell replacement.**

DR. GARTNER: Yes, we haven't talked about that.

**DR. BATTAGLIA: And it seems to me that, while the claims made for stem cells are outlandish—I mean, too much politics got involved in this whole discussion—still, it is likely that we're going to learn a great deal more about**



stem cell replacement, whether it's in the heart, the brain, the spinal cord, wherever. There are lots of times when newborns will need that. We talked about learning the links between fetal and neonatal development and adult disease, and it seems to me that if we learn more about that process, then we're going to say, "How do we prevent that later adult disease?" That takes us back to how do we remodel the islet cells. If this baby is born with islet cell hyperplasia, how do we remodel it quickly and maybe avoid these problems? If a baby has, even in utero, a cerebral infarct or vascular bleed and tissue is damaged, how, if we're in a position, are we going to do stem cell replacement early on?

DR. GARTNER: Good question.

**DR. BATTAGLIA:** If we're talking about where might neonatology go, that to me is so much more likely to have a greater payoff than worrying about an artificial placenta in an 18-week pregnancy. I mean, first of all, I hope we would know how to continue that pregnancy better and not pull the baby out so early.

DR. GARTNER: Good. Anything, Carol, that you want to ask that we didn't cover?

C. GARTNER: What about what obstetricians are doing now in terms of scheduling deliveries? As a perinatologist, what would be your advice on that?

**DR. BATTAGLIA:** As a perinatologist, I would say that there are many, many reasons why you would want to let natural delivery occur. That whole process of parturition does things that are important to the baby endocrinologically and in many other ways that are important, immunologically. So I don't think you time deliveries largely for convenience. I think it's really important. Family size is small. There ought to be a prime focus on making things go as well as they can.

C. GARTNER: That's an important point.

My other question really is quite different, sort of going back to some of the things we've talked about earlier. I'm just curious: You're married to a physician, a person who is also a pediatrician who was interested in a lot of things you were. Did her work—did your interactions with Jane influence your work in neonatology at all?

**DR. BATTAGLIA:** Yes. Obviously a couple talks about their interests, right? And so I knew what Jane was trying and doing in terms of new ways of treating croup, for example, or new ways of handling a respirator and when was paralysis contraindicated or was it indicated, so that had some bearing on my approach in the nursery. But we talked a lot about what were

the problems she saw in the OR and how the neonatologists get babies ready for surgery and what was the interaction with anesthesiology and with surgery. As a result, I think that I placed more importance on communication, that everybody be on the same wavelength, regardless of your medical title. Certainly that did.

Jane's interest in ethics and humanities had a big impact on me and how I felt. The fact that my colleague, André Hellegers, really became a leader in that field in obstetrics also had an impact. André and Jane would sit here and talk for hours on end on issues, and I listened; I couldn't contribute as much, but I was listening. I was an interested listener, and I like to learn from people. I think I really do like to learn from people. I said at the Howland talk, that Jane would get mad if she were here, but fortunately she can't hear.

Jane really was the best example of a scholar I knew. Throughout our contact, she was the best. Many, many, many years ago, when kids were really tiny, she was going to give a talk to the League of Women Voters on China. She must have read 6 huge tomes about Chinese history, had maps of China in different centuries all over the house. She gave a marvelous talk, but she goes in really deep. She gave a talk on "Asphodel" and William Carlos Williams' poetry. Again, it was just something she had worked and worked and worked on. Recently, at the European medical ethics meetings, attended largely by Dutch ethicists, she gave a talk on the 2 fringe philosophers, [Michel] Foucault and [Emmanuel] Levinas, synthesizing this. Now, these 2 people were not always on the same wavelength, but she saw where there was that common ground.

I've learned a lot from her. Yes, really have learned a lot. How much she's learned from me, I don't know. I tend to be more a Sherlock Holmes type. If it isn't relevant, I don't know about it. She's always amused at what I don't know, and the fact that it doesn't bother me in the least that I'm ignorant of this. [Laughter] I've always been that way. She is completely different. So it's been wonderful for me. I learn a lot.

DR. GARTNER: That's a wonderful sharing.

DR. BATTAGLIA: Right. As I say, when she went to China, who else would take 6 months with a private tutor so she could give her talks in Chinese?

DR. GARTNER: Wow. That's amazing that she was able to do that. That's very impressive.

DR. BATTAGLIA: She's lectured in France in French and in Italy in Italian.

DR. GARTNER: Wow. That's astonishing. I really admire that.

Fred, anything you want to add?

**DR. BATTAGLIA: Well, just that I think this is a marvelous idea you had.  
Thank you.**

[End of interview.]

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## CURRICULUM VITAE

### Biographic Sketch

- Name:** Frederick C. Battaglia, M.D.
- Date and Place of Birth:** February 15, 1932; Weehawken, New Jersey
- Present Position:** Professor Emeritus, Department of Pediatrics and Obstetrics Gynecology  
Chair Emeritus, Department of Pediatrics
- Present Address:** University of Colorado Denver  
Perinatal Research Center, F441  
13243 E. 23<sup>rd</sup> Avenue  
POB 6508  
Aurora, CO 80045  
Phone: (303) 724-0546/0547  
FAX: (303) 724-0898
- Citizenship:** U.S.A.
- Marital Status:** Married: Jane Barbara Donohue Battaglia  
Children: Susan Kate, May 1, 1964  
Thomas Frederick, February 25, 1966
- Education:**  
Cornell University, College of Arts and Sciences, Ithaca, New York, B.A., 1950-1953  
Yale University School of Medicine, New Haven, Connecticut, M.D., 1953-1957  
Internship, Department of Pediatrics, Johns Hopkins Hospital, Baltimore, Maryland, 1957-1958  
Fellowship, U.S.P.H.S., Department of Biochemistry, Cambridge, England (Dr. Philip Randle's laboratory), 1958-1959  
Fellowship, Josiah Macy Foundation, Department of Physiology, Yale University School of Medicine, New Haven, Connecticut (Dr. Donald Barron's laboratory), 1959-1960  
Residency, Department of Pediatrics, Johns Hopkins Hospital, Baltimore, Maryland, 1960-1962  
Fellowship, Surgeon U.S.P.H.S., Member, Laboratory of Perinatal Physiology, NINDB, NIH, San Juan, Puerto Rico, 1962-1964
- Licensure:** Colorado 1965
- Board Certification:** American Board of Pediatrics, 1964; Recertification 1992  
American Board of Pediatrics, Subboard of Neonatology-Perinatology, 1975; Recertification 1992  
Board Member, American Board of Pediatrics, Subboard of Neonatology-Perinatology, 1977-1980

## **Academic and Hospital Appointments:**

### Academic Appointments

Assistant Professor, Department of Pediatrics, Johns Hopkins University, Baltimore, Maryland, January 1963 - February 1965  
Associate Professor, Departments of Pediatrics and Obstetrics-Gynecology, University of Colorado School of Medicine, Denver, Colorado, March 1965 - June 1969  
Professor, Departments of Pediatrics and Obstetrics-Gynecology, University of Colorado School of Medicine, Denver, Colorado, July 1969 - present  
Director, Division of Perinatal Medicine, University of Colorado School of Medicine, Denver, Colorado, January 1970 - June 1974  
Chairman, Department of Pediatrics, University of Colorado School of Medicine, Denver, Colorado, June 1974 - September 1988

### Hospital Appointments

Attending Pediatrician, John Hopkins Hospital, Baltimore, Maryland, 1962  
Attending Pediatrician, Union Memorial Hospital, Baltimore, Maryland, July 1964 - February 1965  
Co-Director, Newborn Center, Colorado General Hospital, Denver, Colorado, 1967-1974  
Attending Pediatrician, The Children's Hospital, Denver, Colorado, 1967 - present  
Attending Pediatrician, Denver General Hospital, Denver, Colorado, 1967 - present  
Attending Pediatrician, Fitzsimons Army Medical Center, Denver, Colorado, 1970 - present

**Major Scientific Interest:** Perinatal physiology

### **Sabbaticals:**

Josiah Macy Foundation, Laboratoire de Physiologie du Developpement, College de France, Paris, France, July 1978 - June 1979  
Universita' di Milano, Department of Obstetrics and Gynecology, Milano, Italy, January 1986 - July 1986.  
Istituto di Puericultura e Medicina Neonatale, Parma, Italy, September 1997 - November 1997.

### **Other Activities and Honors:**

#### Honors

Phi Beta Kappa, 1953  
Sigma Xi, 1960  
Member, Institute of Medicine, 1986  
Honorary D.Sc., University of Indiana, 1990  
Honorary Member, American Gynecologic & Obstetrical Society, 1983  
Honorary Member, Society of Maternal-Fetal Medicine, 1993  
E. Mead Johnson Award for Pediatric Research, American Academy of Pediatrics, 1969  
Virginia Apgar Memorial Award, Metro Denver March of Dimes, 1984  
March of Dimes Agnes Higgins Award, 1986  
Borden Nutrition Award, American Academy Pediatrics, 1991  
Faculty Teaching Award, American Academy Pediatrics, 1991  
Virginia Apgar Award in Perinatal Medicine, American Academy of Pediatrics, 1996

Council Member, Society for Gynecologic Investigation, 1969-1972  
Secretary-Treasurer, Perinatal Research Society, 1970-1973  
President, Perinatal Research Society, 1974-1975  
President, Society for Pediatric Research, 1976-1977  
President, Western Society for Pediatric Research, 1987  
President, American Society Pediatric Department Chairmen, 1985-1987  
President, American Pediatric Society, 1996  
President, World Association of Perinatal Medicine, 1996  
Recipient, John Howland Medal, American Pediatric Society, 2004

#### Editor

Medical Progress Contributing Editor, JOURNAL OF PEDIATRICS, 1966 - 1974  
Associate Editor, Pediatrics (Editor, Barnett), Publisher - Appleton- Century Crofts, 15th Edition  
EUROPEAN JOURNAL OF OBSTETRICS AND GYNAECOLOGY, (Associate Editor)  
1971 - present  
Associate Editor, BIOLOGY OF THE NEONATE, 1979 - present  
LATIN AMERICAN JOURNAL OF NEONATOLOGY, Editorial Staff, 1997-present  
Editor, JOURNAL OF PERINATAL MEDICINE, 1992-present

#### Reviewer

AMERICAN JOURNAL OF PHYSIOLOGY  
NEW ENGLAND JOURNAL OF MEDICINE  
PLACENTA  
PEDIATRIC RESEARCH  
PEDIATRICS  
JOURNAL OF PEDIATRICS  
AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY  
OBSTETRICS AND GYNECOLOGY  
METABOLISM  
NUTRITION  
JOURNAL OF PERINATOLOGY  
EUROPEAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

#### Other Activities

March of Dimes Study Sections: Clinical Research, Basic Science Research,  
Chairman, Basil O'Connor Award Committee  
The Joseph P. Kennedy, Jr., Foundation Scientific Advisory Board, 1983  
Institute of Medicine "Fetal Research" Committee  
Institute of Medicine Membership Committee  
Institute of Medicine Subcommittee on Nutrition/Nutrition Sciences, 1997-Present  
Institute of Medicine Committee of Perinatal Transmission of HIV, 1997-Present  
Institute of Medicine, Chairman, "Fetal Alcohol Syndrome" Committee  
NIH Low Birthweight Committee, 1984  
Association of Medical School Pediatric Department Chairmen, Inc. (AMSPDC), Task  
Force for the Pediatric Scientist Training Program, 1984  
AMSPDC Pediatric Scientist Training Program, Chairman, Steering Committee, 1986-  
1992



External Advisory Committee, Nutrition Center, Baylor University, 1994-Present  
External Advisory Committee, Riley Children's Hospital, University of Indiana, 1988-1992  
External Advisory Committee, Yale University School of Medicine, 1989-1994  
External Advisory Committee, Montreal Children's Hospital Research Fund, University of Montreal, 1991-Present  
American Academy of Pediatrics, Chairman, Residency Research Award Committee, 1993-1998  
Council Member, Western Society for Pediatric Research, 1984

**Professional Society Memberships:**

Society for Pediatric Research, 1963  
Western Society for Pediatric Research, 1965  
Society for Gynecologic Investigation, 1965  
American Association for the Advancement of Science, 1965-1981  
American Academy of Pediatrics, 1966  
American Pediatric Society, 1968  
Perinatal Research Society, Founding Member, 1970  
Society for Experimental Biology and Medicine, 1971  
Association of Medical School Pediatric Department Chairmen, Inc., 1974-1989  
American Gynecologic Society, Honorary Member, 1980  
Member, Association of American Physicians, 1983  
American Academy of Pediatrics, Colorado Chapter, Executive Committee, 1984  
Member, Perinatal Section, American Academy of Pediatrics, 1984  
Member, American Clinical & Climatological Society, 1994