ORAL HISTORY PROJECT

Robert H. Bartlett, MD

Interviewed by
Jay L. Grosfeld, MD

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New Orleans, Louisiana

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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**

Jay L. Grosfeld, MD, FACS, FAAP

Dr. Jay L. Grosfeld is the Lafayette Page Professor of Pediatric Surgery at the Indiana University School of Medicine in Indianapolis, Indiana. He attended both undergraduate school and medical school at New York University [NYU], graduating from the latter in 1961. He trained in general surgery at NYU under Dr. Frank C. Spencer from 1961-1966. After two years as a captain in the US Army Medical Corps (1966-1968), he obtained postgraduate training in pediatric surgery at the Columbus Children’s Hospital, Ohio State University (1968-1970) under the direction of Dr. H. William Clatworthy, Jr. At the conclusion of training, Dr. Grosfeld’s first full-time academic position was assistant professor of surgery at NYU School of Medicine from 1970-1972. In 1972 Dr. Grosfeld was appointed professor of pediatric surgery at Indiana University School of Medicine and the first surgeon-in-chief of the Riley Children’s Hospital in Indianapolis. He has remained at Indiana in that position for the past 32 years.

From 1985-2003, Dr. Grosfeld served as chairman of the Department of Surgery at Indiana University School of Medicine and training program director of the general and pediatric surgical residencies. He was chairman of the American Board of Surgery in 1997 and also served as vice-chair of the ACGME-Residency Review Committee for Surgery. In 1995 Dr. Grosfeld was elected president of the American Pediatric Surgical Association and was secretary and then chairman of the Section on Surgery of the American Academy of Pediatrics [AAP]. He has been a member of the AAP for 30 years and is a previous William E. Ladd Medical recipient.
DR. GROSFELD: This is Dr. Jay Grosfeld from Indianapolis, Indiana. It is October 31, 2003, and we are interviewing Dr. Robert Bartlett who is the 2003 recipient of the William E. Ladd Medal from the Section on Surgery of the American Academy of Pediatrics. This interview is taking place in New Orleans, the site of the annual meeting of the Academy.

Dr. Bartlett, I am delighted that you could be here today and share with us some of your background. I am going to ask you a series of questions regarding some things about you personally and will ask you to respond.

Tell me about where you were born, and about your parents and your siblings, give us a little background about your family life. Were there any specific events in your childhood that had an influence on your career choice?

DR. BARTLETT: My dad was a surgical resident at University of Michigan. He was, in fact, chief resident the year I was born. So I was born in May in University Hospital in Ann Arbor, Michigan, where I practice now. And in July, my family moved from there to Akron, Ohio, where I grew up. My dad was a surgeon, and Akron was a typical midwest medium-sized town. A great place to grow up, in retrospect.

I was the oldest child in the family. My mother was a teacher. I have three younger siblings, none of whom have gone on into medicine. They’re into various scientific and semi-scientific fields; political science and things like that.

DR. GROSFELD: So, it’s basically your dad’s career and his love of what he was doing that influenced you to pursue a surgical career?

DR. BARTLETT: I suppose so, subconsciously. My career plans changed from wanting to be a cowboy to a forester to a musician to a professional hockey player. Years ago, I found an essay I wrote in high school on, “What do you want to do?” I’d written an essay about surgery, which is what my dad did. But he never pushed me into it.

His advice (which I’ve given to my kids, and I will tell you it’s bad advice) was, “Do anything you want, just do it really well.” Sounds like good advice, but one of my kids wanted to be a musician. So with the advice should go, “Do anything you want that you can earn a living at, and do it really well.” [Laughter].

DR. GROSFELD: So, when was it that you really first became interested in medicine? Was it as an undergraduate?
DR. BARTLETT: It's clearly as a high school student, because by the time I was halfway through high school, I knew that I wanted a scientific career. I knew I wanted to teach; I enjoyed teaching. What I really wanted to do is be a musician, but I was aware that it would be hard to make a living as a musician. Plus it's non-science.

I haven't thought much about it until recent years when people ask me questions like this, but my choice of an undergraduate college (Albion College, a small, small college in Michigan) was based on the fact that I was looking for a college which was a small school. I knew I was going to go to medical school eventually and wanted the small school experience. It had to be a place that had a really good music program and a hockey team, and a good pre-med program. So I looked at the small colleges in the Midwest and looked in the back of the University of Michigan Medical School book to see where their students came from. More came from Albion than any other place. So I wound up at Albion.

DR. GROSFELD: What instrument did you play?

DR. BARTLETT: Well, in those days, I was playing euphonium, which is a baritone horn, sort of a small tuba, and also the double bass. My major instrument is really the bass.

DR. GROSFELD: Did you and your siblings have a band of some type?

DR. BARTLETT: Not my siblings, they were too young. But I had a dance band all through high school and all through college. We had a very good dance band in college. It was called “Charlie Brown and His Orchestra,” named after the Peanuts® character. All the fronts had pictures of Charlie Brown and Linus and Lucy and so on. It didn't mean anything except that it was kind of a pop icon of the day. But we had a big band, a seventeen-piece band. We played all around the Midwest, actually. Now we know it was the end of the big band era, but at the time, it was pretty hot stuff.

DR. GROSFELD: And what did your dad think when you chose to enter medical school. Was he excited about that?

DR. BARTLETT: Yes, I think he was very pleased.

I only applied to Michigan because that was clearly where I wanted to go for a whole variety of reasons. I got in, actually, after my junior year. In those days Albion and Michigan had a program that involved three years of undergrad, with a lot of science in it, and then they gave you an undergraduate degree after your first year of medical school, which is what I did. So I went through college and medical school in seven years.
DR. GROSFELD: When you were in Ann Arbor, what made you pursue a career as a surgeon?

DR. BARTLETT: Well, the usual things, great role models: Bill [William] Fry, Dick [Richard O.] Kraft. Another good role model was a man named Dick [Richard] Judge, who was a cardiologist, who was the bright young guy in the medical school in those days, and still is a very good friend and mentor now. I’m going to operate on him next week, as a matter of fact. [Laughter].

But it was a choice of exclusion. What I really wanted to do was general practice. Having gone through med school, I loved everything. I liked delivering babies; I liked operating; I liked taking care of medical problems. And I realized that the general surgeon at the time, in the sixties, was the one specialty where you didn’t have to give anything up or give up as much as you did in the other specialties. So, I went into general surgery with an idea of being the total general physician; that was my goal.

DR. GROSFELD: Why did you pick the residency program that you trained in?

DR. BARTLETT: Well, I trained at a now defunct hospital, the Peter Bent Brigham Hospital with Francis Moore, and, of course, that turned out to be a wonderful place. In the match process I traveled around and I was quite sure that I would wind up at Columbia [Columbia-Presbyterian Medical Center]. I wanted to leave Ann Arbor, just get a broader experience somewhere. I didn’t have any grand academic aspirations, and at the time I was just looking for a good residency. I interviewed several places, [Johns] Hopkins [Hospital] and the New York hospitals, and the Brigham, and a few other places. Brigham was my first choice and, somewhat to my surprise, I wound up matching there.

DR. GROSFELD: Well, did you like living in Boston having grown up in the Midwest?

DR. BARTLETT: I loved Boston. Boston was great. And as it turns out, the people that were there, my co-interns and residents and the staff and everyone that I worked with in Boston at the Brigham and at the Children’s [Children’s Hospital Boston], were just spectacular people. At the time it was just working hard, “No one appreciates us; we take good care of patients,” and a lot of camaraderie among the residents slogging through a residency. Looking back on it, of course, it was absolutely wonderful. But you don’t remember the tough times; you just remember the good times.

The Brigham residency and the Mass General [Massachusetts General Hospital] residency at the time, maybe Hopkins also, were the last of the
combined thoracic and general surgery residencies. So you went through the program and finished with board eligibility in general and thoracic surgery. We did a lot of thoracic surgery. It was the early days of cardiac surgery, and literally half of my residency years were spent doing thoracic and cardiac surgery.

About midway through the residency, which would have been 1967 or 1968, the [American] Board of Thoracic Surgery decreed that there would be no more mixed programs, so that now you had to take at least one year of cardio-thoracic residency after general surgery. So, one of my resident buddies, Arnie [Arnold] Coran and I wrote to the board saying, “We’re going to finish in 1969, and we started this program expecting to be able to take thoracic boards. We’d like to do that. What do you think?” They wrote back letters saying, “Well, okay, you still qualify since you’re in the program.” So when we finished and then passed our general surgery boards, we took the thoracic boards. Arnie and I were the last residents from mixed programs to be allowed to take the thoracic boards. The other guys that applied in our year were told they had to take an extra year of training, but we could produce this letter from the board saying we were allowed to do it.

DR. GROSFELD: Now, things have changed quite a bit over the years, both for medical students and for residents. How do you view the current medical education and the changes that occurred since the time when you were a student? Do you think it’s better?

DR. BARTLETT: [Laughter] It’s probably better. It’s probably better in many ways. We grew up with the idea that you lived in the hospital and you went home on occasion. If you were on every other night, you missed half the good stuff, and I believe that to this day, I must say. So that the current idea of sending residents home just because certain amount of time has elapsed and the like is not wise for training in surgery. Certainly when you’re practicing, if you’re real tired and you have a sick patient to take care of, you don’t just go home, you take care of the patient. So we are going to train habits into our residents that are not good habits for surgeons.

Nowadays, of course, there’s all sorts of ancillary help for the residents which they don’t appreciate, but, again, when I was a resident (as when you were), if a patient needed a white count you did it; if a patient needed a gram stain you did it; if the patient needed an EKG [electrocardiogram] you got a machine out and did it. If the patient needed to go to x-ray, you took him to x-ray. If a patient needed a chest x-ray and you knew where the portable chest x-ray unit was, you were a high-powered resident. You could go find it in a closet, hook it up and take a chest x-ray.

I was popular among my resident group, because I knew how to take apart and fix the blood gas machine. So I could do blood gases on anybody in the
middle of the night when the membranes broke on the machine and things like that. I think the modern residents don’t do that. In our hospital today, there isn’t any hematocrit centrifuge, there isn’t any gram stain laboratory that the surgery resident could get to. There’s no microscope to look at a gram stain for gonococcus, even in our own ER [emergency room]. So there’s a lot to medicine that was directly hands-on when we trained that the residents today don’t have. I think they have the same dedication to take care of patients. But, the idea, “if you want to know what’s in the chest just put a needle in it and find out,” is shocking to the modern day resident.

DR. GROSFELD: Certainly the explosion of new information and the advances in technology that affect the way we treat patients today has made a huge difference in what the students learn and then how they go about making a diagnosis and even treating the patient. Now you were a pioneer, in your day, in the development of some of this technology. You are a general surgeon, and yet you have had a significant experience caring for children, and your contributions have been superb. The initiation of the extracorporeal life support concept and ECMO [extracorporeal membrane oxygenation], has been a major contribution and obviously that is one of the factors that resulted in your receiving the Ladd Medal. Tell us a little about how you got interested in children, and what the problems were at the time that made you pursue the use of extracorporeal life support for babies?

DR. BARTLETT: My research interest in medical school was atherosclerosis. My plan was always to solve the problem of atherosclerosis. I was a lipid chemist. But, when I was on rotation at the Children’s Hospital [Boston], Dr. [Robert E.] Gross, of course, was the chief and is deity as far as I am concerned, a wonderful man, a wonderful surgeon. A whole string of unusual events led to my getting interested in, and actually trying to do, prolonged cardiopulmonary bypass.

The quick story is that these were the early days of cardiac surgery, and most of the complicated cases, tetralogy, transposition of the great vessels, even VSD [ventricular septal defects] and AV [arterioventricular] canal, were done on children that were six to twelve years old, usually after palliative shunts of one type or another. The mortality rate for those kids was about 50%. They died in the first two or three days following operation because of low cardiac output, acidosis, poor tissue perfusion, and renal failure. Myself and my resident buddies sat at many bedsides, many nights ventilating babies by hand with a bag. There was no intensive care unit as such. There was no kind of organized system for critical care. If you took care of a kid with a hernia or a tetralogy, it was all about the same; they went to the same place in the hospital.

Because of that I proposed to Dr. Gross that we just put these kids on a heart lung machine for a day or so. We knew that if they could make it through
the first couple of days, they all survived and they all did very well. He thought it was reasonable, but the problems were that the conventional heart lung machine in those days was lethal after about two hours on bypass. It caused all kinds of problems and killed patients. So he said, “Why don’t you explore it?” It was clear that the cause of the problems was mostly the oxygenator, which is a device that permits a direct exposure of blood to oxygen. A senior resident named Lou Plazik was at the Children’s Hospital, and Lou got interested in using silicone rubber to make various things because it was very inert. It’s not really rubber; it’s a plastic. And he knew that silicone rubber would transfer respiratory gases, so he could make a solid membrane out of it and make a membrane lung. We built a membrane lung. It didn’t work very well. Phil [Philip A.] Drinker, was an engineer from MIT [Massachusetts Institute of Technology], who Dr. Moore had hired to come to the Brigham to spend a year to see what engineers could do in the hospital. He was really the first of the bioengineers, if you will. Between Phil and I, we built a very good membrane oxygenator. That led us to doing prolonged bypass procedures. We could put dogs on bypass for four days at a time and that was pretty hot stuff in 1967 and 1968. So, with that, we went on to explore what it would take to use cardiopulmonary bypass for a long time.

In 1970, I left the Brigham and took my first outside-of-Boston academic job at UC [University of California] Irvine. It was a brand new medical school, where there was no one to say, “You can’t do this, you can’t do that.” The chairman, Jack [John E.] Connolly, recruited general surgeons who were also boarded in thoracic surgery and trained to do pediatric surgery and vascular surgery. So another resident buddy, Al [Alan] Gazzaniga, and I joined this very small faculty of a brand new medical school, set up a research lab in a old Quonset hut and went to work on this problem. We first hooked the oxygenator up to a patient in 1972, and then sort of went on from there.

DR. GROSFELD: What were some of the clinical conditions that were relatively lethal at the time that this new technique seemed to help the most?

DR. BARTLETT: Our initial interest was in children. Because we were surgeons and we were doing all the pediatric and cardiac surgery at that time in Orange County Medical Center, we first applied the oxygenator to our own patients, who were children failing after major thoracic operations. It worked quite well, because we were the designated pediatric surgeons for the hospital. As you said earlier, I am not a “pediatric surgeon,” but this was prior to the time when there was such a thing as a board certified pediatric surgeon, which came along in 1975. So we did all of the neonatal cases in the hospital and got asked to see babies who had infant respiratory distress syndrome, hyaline membrane disease, diaphragmatic hernia, meconium aspiration, and neonatal sepsis. We worked with the neonatologists all the
time and they were aware of what we were doing in the lab, helping us out in fact. So we started testing using the oxygenator in newborn infants with severe respiratory failure. We had the first successful case in 1975, and that led to more and more cases.

[M.] Judah Folkman always said that if you stand now and look back on his surgical career, it looks like brilliant, well planned, sequential research; but, in fact, it was just a series of starts and stops trying to address a problem. For me, it was exactly the same. We were doing a lot of other things at the same time. I was running a big burn unit; we were running an intensive care unit; we ran a huge surgical practice, doing everything from hemorrhoids to aortas and everything in between; and had a great time. So this was just kind of a side hobby for a while, although we got NIH [National Institutes of Health] funding. It was proof of the principle that if you could keep a really sick person alive long enough through mechanical means, their native organs might recover. That led to all the subsequent clinical research we’ve done on that topic.

DR. GROSFELD: This started out with little babies, but have you then taken this to another level and used the concept of ECLS [extracorporeal life support] in older children and perhaps even in adults?

DR. BARTLETT: Yes, in fact, the first major application of this technology was in adults. At the same time we were working on this, we were treating adult patients as well (unfortunately mostly unsuccessfully) with the brand new diagnosis of ARDS [acute respiratory distress syndrome]. It had gone by other names in the past, congestive atelectasis and post-operative respiratory failure and the like, but in 1972, this condition of respiratory failure following shock, trauma, sepsis and the like, became recognized as ARDS. It was sort of epidemic around the country. Looking back, it was an epidemic because ventilators were being used clinically for the first time but were used poorly, and fluid management was also used relatively poorly; but, nonetheless, it was a common problem. There were a few other centers in addition to ours and a few other laboratories that were studying prolonged extracorporeal circulation. About five of them, including one in San Francisco, one in Boston, and one at the NIH (Ted [Theodore] Kolobow’s program). In order to address the ARDS problem, the NIH sponsored a multi-center trial of what became known as ECMO, a name which I don’t like very much, but it stuck with this technology. There was a nine-center trial that went on from 1975 to 1979, the intent of which was to cure ARDS. Well, it didn’t, of course; the mortality was 90% in the treated group and in the control group, which really set back the use of this technology in adults for decades. But we continued to work on the children and had good results there.
We collaborated with the one other center in the world that was working on adult respiratory failure, which was in Milan, Italy, run by [Luciano] Gattinoni. He and I, through the 1980s and early 1990s were sort of the only people still working on this technique. In the 1990s, we started applying it again to adults and older children, and it now is a fairly standard therapy in every neonatal ICU [intensive care unit], most pediatric ICUs and it’s just growing into the adult ICU world.

DR. GROSFELD: Have you used this at all on children that had drowning episodes?

DR. BARTLETT: Yes, we’ve looked at this in all types of cardiac and respiratory failure in which there is reason to think that the patient might ultimately recover. So, we have used it for drowning and every type of pneumonia, aspiration, and trauma—virtually anything that can cause severe respiratory failure. In the last five years, most of the application has been in cardiac failure. It’s sort of cycling back to the way we started, patients failing after major cardiac operations, or nowadays patients who are awaiting heart transplant or who’ve had a major myocardial infarction, awaiting some other type of treatment, post cardiac arrest, pulmonary embolism, patients like that.

DR. GROSFELD: Some of the patients have poor cardiac output, or have arrhythmias and don’t pump the blood very well?

DR. BARTLETT: Yes, that’s right. Probably half of our clinical practice now, which is more than a hundred cases a year, is more for cardiac support than pulmonary support.

DR. GROSFELD: Now that ECMO has caught on pretty much all over the world and children are placed in both the national and international registries, how many children have been treated with this technology?

DR. BARTLETT: There are now about thirty thousand patients in the registry, about half of which are newborn infants, and the other half are children. About a thousand of those patients are adults, so the adult experience is growing rather slowly. Every major children’s hospital in the first world countries either has an ECMO program, or has a way to transfer patients who might need it.

One of the best things about ECMO is that it acts as a parachute. It’s there when everything else fails and has known results when everything else fails. So, it gives everyone the opportunity to try other things, and this led to development of other treatments, which are simpler and therefore better, like inhaled nitric oxide and avoiding hyperventilation and things like that, that have really decreased the mortality for respiratory failure in children.
DR. GROSFELD: Did you take this technology overseas?

DR. BARTLETT: We did. When we first started doing this, other neonatologists and surgeons were interested in it, so we’d run annual courses for many years and still do on occasion. People would come, at first to Irvine, then to Michigan to learn what we were doing and how to do it. We would give them a shopping list and show them how to set up a laboratory to test this in the lab, and in that process several centers came from Europe that learned how to do it, and Japan set up their programs at home.

DR. GROSFELD: Dr. Bartlett, one of the other major contributions that you are somewhat famous for, is the use of hemofiltration as a technique to help both children and adults that have problems with their kidney output. Tell us a little bit about that.

DR. BARTLETT: Well, hemofiltration, yes, we’re very proud of that actually, because it’s now established as standard treatment in intensive care units around the world. We did not invent this, but we were very interested in nutrition related to recovery from acute illness and had studied patients who had acute renal failure and realized that the standard treatment throughout the 1970s was essentially starvation. In those days, the more you fed patients, the more their BUN [blood urea nitrogen] went up, and the more they needed dialysis. Every time they went on dialysis, they got worse rather than better for reasons that we now understand. So it was standard practice not to feed critically ill patients in renal failure, or if you fed them at all, you fed them a very small amount of essential amino acids to minimize protein catabolism. We did a series of studies showing that starvation was one of the factors accounting for the high mortality in acute renal failure, which at the time was 90%.

We presented these papers at the ASAIO [American Society for Artificial Internal Organs], and on the same program was a man named Peter Kramer from Gottingen, Germany. He had simply hooked up a hemofilter to an artery and a vein and used it to treat acute renal failure. He showed that you could filter off huge volumes of fluid without being deleterious to the patient as long as you replaced the volume with some extracellular fluid substitute. We saw this as the solution to the nutrition problem, so we went home and attempted to corroborate Kramer’s work, which we did. We started hemofiltration to provide appropriate nutrition, lots of calories, lots of protein, to patients in acute renal failure. Over the next few years, we showed that, indeed, those patients treated with hemofiltration had a lot better survival rate than the patients that were treated in the standard fashion of the time. By the mid-to late-1980s, hemofiltration for acute renal failure started to be practiced in many ICUs. Nowadays it’s the standard
practice for patients who are critically ill with multiple organ failure, including renal failure.

DR. GROSFELD: When did you move to the University of Michigan after you left California?

DR. BARTLETT: I planned to be in California for about two years, but I actually stayed there for ten years. As I said, my partner and I had a wonderful time. We had a great practice. For various reasons, I decided to move to a larger academic center. Our grants were successful. Our research was quite successful. It was clear that Irvine was never going to be a major research institution, so in 1980 I decided to leave Irvine. I had good offers in other major centers and, decided to return to the University of Michigan, where I had gone to medical school.

DR. GROSFELD: You became the director of the surgical critical care program there?

DR. BARTLETT: Yes, although there was no such thing at the time when I went there. I just joined the faculty in general surgery to do general surgery practice and to run the ICU. The ICU was kind of an appendage on the recovery room and really wasn’t what you’d call a modern ICU as we know it in current times. It was, but nothing like we would appreciate today.

Shortly after being there, the chairman, Jerry [Jeremiah G.] Turcotte, asked me to be the chief of general surgery, which I did for about seven years. During that time, we built a new hospital, which had all the sort of modern versions of intensive care, and I became director of the program in intensive care for the department of surgery.

DR. GROSFELD: You have remained in that position for how many years?

DR. BARTLETT: Well, I’ve been there 23 years now, so I’ve been running the critical care program which has included the ECMO program and all the other things that go along with critical care. When Jerry Turcotte stepped down and Lazar Greenfield came as chairman in 1986, I encouraged him to take over the general surgery job as well, which he did. Looking back at various stages of my career, I was asked to be the departmental chairman at various places around the country or at least looked at chairmanship positions. I decided along the line not to become a chairman or the director of any particular program. For me, this was a good decision, allowing me to keep research and my own practice in line.

DR. GROSFELD: You have had a very illustrious career. You’ve been the recipient of quite a number of awards and becoming a Ladd Medal winner and not
actually being a pediatric surgical physician is very special. I’m sure that must be very meaningful to you.

DR. BARTLETT: It is indeed. The Ladd Award is particularly meaningful because I trained with Dr. Gross, who, of course, trained with Dr. Ladd; so, it’s a very special relationship back to my own roots. Of course, as you say, I’m not a, a card-carrying pediatric surgeon; but, I have been taking care of children from neonates up to adolescents essentially all of my career so I stay active in the pediatric field.

DR. GROSFELD: Are you currently training pediatric surgeons to do these special things with the techniques that you have developed and refined?

DR. BARTLETT: We are. We have surgeons that come to spend a year or two with us in the laboratory and that always involves clinical research and also clinical application of these techniques. Many of those surgeons are people who are heading for careers in pediatric surgery or who are already trained pediatric surgeons. When I say we, I’m referring to Arnie Coran, Ron [Ronald B.] Hirschl, and the seven or eight other surgeons who restrict their practice to pediatric surgery at Michigan.

DR. GROSFELD: What have been the biggest changes in the care of the children in your environment over the time of your career?

DR. BARTLETT: I think the major factor has been the development of critical care, which didn’t exist as a separate discipline when I started. Now it is, in my view, too specialized. There are separate specialists for neonatology and pediatric intensive care at least in United States, for example. With the specialization of the physicians has come the specialization of nurses and respiratory therapists and other people who devote their entire career to nothing but management of critically ill patients, and with that has come a lot of technology and devices that make it possible to do that.

DR. GROSFELD: Has operating on the children changed much as far as their heart surgery is concerned?

DR. BARTLETT: The major change in cardiac surgery for children has been the move to earlier and earlier repair of complex defects. Nowadays, we almost never do a palliative operation for cyanotic heart disease, but rather do an operation to repair the primary defect even in babies as young as a few days old, but usually within the first six months of life. All cardiac problems are addressed and repaired in the neonatal period.

DR. GROSFELD: You mentioned a number of names of individuals that were chairmen of the departments that you were in. When you look back at your
career, who were the people that were most helpful to you in establishing yourself as a young surgeon?

DR. BARTLETT: The biggest influence by far was Francis Moore, who was my chief at the Brigham and who stayed in touch and was always available throughout my career. From my point of view, he was probably the most important surgeon of the last century. Another person that was a major influence was Dr. Gross, even though I only spent a year there, and that as a junior resident. I stayed close to him over the years, until the time of his passing.

DR. GROSFELD: You’re referring to the Children’s Hospital?

DR. BARTLETT: Children’s Hospital Boston, yes, that’s right. In terms of other people helping my career, the chairmen that I’ve worked with, Jack Connolly at Irvine, Jerry Turcotte and Lazar Greenfield at Michigan, have all been exceptionally helpful and supportive, mostly by creating an environment where it was possible to do the kind of clinical practice and research that I was doing. Whenever I needed help they were always there to write to the appropriate committee or various other people.

DR. GROSFELD: You have recently received a couple of other prestigious awards. Tell us a little bit about that.

DR. BARTLETT: I have and it’s a little embarrassing in a way, because I don’t view what I’ve done as a grand research career. I’ve just been plugging away. The extracorporeal life support research has been sort of a scientific hobby, but an important one, I suppose. This has now been recognized by other groups of my peers and colleagues, which is quite humbling actually. A few years ago, I was invited to give the [Robert E.] Gross Lecture at APSA [American Pediatric Surgical Association], which was an exciting event particularly because the President, Arvin Philippart was a resident buddy of mine, and also because the lecture is named after Gross, who was, as I said, one of my great influences in surgery.

A couple of years ago, I was given the Medallion for Scientific Achievement by the American Surgical Association. This is an award that isn’t given terribly often and some of the names of others on the list included Francis Moore, Robert E. Gross and Judah Folkman and other people that I have great respect for, so that was a marvelous honor.

DR. GROSFELD: Dr. Bartlett, there is always a time when experienced and accomplished people reflect on the past. Some of the great minds in medicine have been asked about the future. We have just come through a period of time where the human genome has been elucidated and nanotechnology has become a
part of everyday life. Where do you see the care of children going in the next ten years?

DR. BARTLETT: The major advances will be in prevention and in early identification of genetic disorders. I expect we’ll see the elimination of diabetes, for example, in children through biology and genetic research. In my particular area of interest, there will always be children who are critically ill, whether they’re newborn children or older children. I believe hospitals, in general, will become large intensive care units.

In regard to my particular little corner of interest in mechanical support systems, I believe we are just at the beginning of that. Fifty years from now, it will be routine practice to take any child who is even moderately ill enough to be in an intensive care unit and to go promptly to mechanical support systems, blood processing for heart failure, liver failure, lung failure, and sepsis. I believe those problems will all be treated by mechanical devices, usually for a short time with the expectation of recovery. Some of them will recover using organ transplantation and, rarely, by implantation of mechanical devices, but mechanical replacement of the heart, for example, or the lung or the kidney will not be necessary. These mechanical supports will be simply bridges to transplantation.

DR. GROSFELD: Do you think we’ll ever see a time when we will achieve immune tolerance, and organ transplantation will be a much more simple and safe procedure than today?

DR. BARTLETT: Yes, definitely so. That won’t be far away. My futuristic project, which I’m embarking on now (my career winding-up project), relates to organ banking. As you know a person who is brain dead has normal organ function for about a day, and then all the organs fail, for reasons that no one understands. The same thing happens with a normal organ placed on a perfusion machine. With an ECMO machine, we can keep really sick people alive for six weeks at a time, but we can’t keep a normal kidney, heart, lung, and liver alive for more than 24 hours. The physiology has to be the same. It’s the lack of a live brain, and that leads us to believe that the brain makes a hormone that we have never identified that maintains capillary integrity. When we discover that, we will be able to maintain organs on perfusion machines for literally years at a time. When we do that, we can modify their immune status, whether they are animal organs that are modified to look like human organs or human organs that are perfectly matched. It will be possible to transplant organs as frequently as we do very simple operations today.

DR. GROSFELD: Do you think there will be a time that you can just sort of take an organ off the shelf and plug it in?
DR. BARTLETT: Exactly. That’s right.

DR. GROSFELD: That sounds very futuristic. [Laughter] When you look at where you have been and where you have come from, in retrospect, do you think the children of today are far better off than the children of 50 years ago?

DR. BARTLETT: Medically yes, definitely so. Fifty years ago polio was still around, children died of sepsis, and children died of congenital disorders all the time. Nowadays that doesn’t happen. So medically, clearly children are a lot better off.

Socially and intellectually, it all depends on where they are, how they grew up, who their parents are.

DR. GROSFELD: I think those probably still remain very important factors in childhood development.

DR. BARTLETT: Right.

DR. GROSFELD: Childhood education certainly has taken a new step forward with all the information that’s currently available. When you started out in the laboratory how did you keep all your data and has data collection and evaluation changed?

DR. BARTLETT: A month ago I wrote my competing renewal grant for my big lab grant, which I’ve had since 1971. Five years ago I told my secretary we’re never going to have to do this again because it’s hard work, but things in the lab were going so well we decided to go back for renewal one more time. In the process of doing that I’ve thought a lot about the days when we not only collected data, but also wrote grants and wrote papers and did research in the beginning of my career. Nowadays we can write a fifty-page grant application, and if one sentence isn’t quite right, we can change it immediately with a computer and it regenerates the entire application; it looks perfect. I was telling the people that were working with me how we used to do this with white-out and type it on carbon paper and all that sort of thing, and most of the people didn’t even know what I was talking about. They didn’t have any idea. So the information technology age actually makes it much easier to keep track of data and conduct laboratory research or clinical research and present the data immediately, in a totally analyzed fashion. So that’s been a big help.

DR. GROSFELD: That’s progress, I guess. [Laughter] Tell us a little bit about what you think of the changes in the educational programs, the development of competencies, and now the development of specific work hours for young people in training.
DR. BARTLETT: As you say, there’s a current emphasis first of all on the amount of time residents spend in the hospital and, secondly, on teaching and measuring competence and professionalism. The latter, I think is nonsense. I’m not sure quite where it came from because the personality, dedication, motivation, competency, and professionalism of physicians relate to habits that are set in kindergarten. These are determined by the admissions committees of medical schools; there’s not much you can do in a residency to change the basic personality of a physician.

As far as the work hours, this, in my opinion, is only an issue in surgery. The other disciplines have never had much of a problem with work hours. If they did, it was simply because they were disorganized, because they have so many residents in medicine, pediatrics, emergency medicine, and the like that it simply wasn’t necessary for residents to be spending more than 60 hours in the hospital. However, the application of the 80-hour workweek to surgical residencies, although it can be done, misses the point entirely. Surgical residents need to have experience taking care of their patients and need to take care of them from the time they get sick till the time they’re well. And if that involves spending 30 hours a week in the hospital or 120 hours, it shouldn’t really matter. The time spent taking care of patients is whatever it is, and I don’t know if you could put a cap on it.

DR. GROSFELD: If you had all this to do over again, would you still become a doctor and a surgeon?

DR. BARTLETT: Sure. This has been great fun for me. In the last 20 years or so, I’ve gone back to music; so, I’m a kind of a regular amateur musician. I’m not very good at it, which is really good for a surgeon. You ought to do something that you’re not very good at so that it’ll bring you back to reality instead of being the king of the hill in the hospital. For me it’s been a wonderful time. I wouldn’t do anything differently.

DR. GROSFELD: Would you recommend the same type of future career for young graduates of medical schools?

DR. BARTLETT: I would. I hear doctors of my age saying that they would not encourage their own children or other children to go into medicine any more because of all the social and political changes that have occurred and regulations made within the medical practice. But my dad told me exactly the same thing and I’m sure this has been going on for centuries, so that the field is as rewarding as it ever was and always will be.

DR. GROSFELD: You mentioned certain kinds of children who have special needs. For instance we know that the leading cause of death in the childhood age group are children who are in accidents; and trauma is the major cause of death. How has your specific development of technology helped those patients that come
into the intensive care unit with severe trauma, where they have multiple organs injured and things just do not work right?

DR. BARTLETT: The research we’ve been working on is very intensive and kind of “one patient at a time” care. Very expensive as well. We ask ourselves all the time, “Is this worth it? Is it worth spending $50,000, $100,000, $200,000 worth of resources on a single newborn, or a single child after severe trauma or any other disease?” And in this country we’re fortunate to be able to do that. It certainly doesn’t happen everywhere, but in some small part, because of efforts at the very extremes of life support and the very extremes of critical illness in showing that some patients will recover. Even with expensive, invasive procedure it leads us to say, “Well, this is worth it,” because normal healthy people, normal healthy children, result from it down the road and it affects the rest of our practice in many ways. Part of it is to say, “If we can do that, then we can surely do things that are less invasive and expensive, that are still intense treatment for children and their injuries.” For example, through that research we’ve learned that the heart, the lungs, the kidney will recover and be perfectly normal a year later under circumstances that 10, 20, 30 years ago were considered to be permanently irreversible situations. So that our management of trauma patients with heart problems, lung problems, kidney problems and the like, has changed across the board, based in some part on the fact that we know that under very extreme conditions, those organs can still recover.

DR. GROSFELD: Are there any adverse quality of life issues associated with the success that you’ve achieved in some of these patients?

DR. BARTLETT: There certainly are. The major one, of course, is that any critically ill person, child or otherwise, who survives a severe multiple organ failure may have sustained brain damage in the process of the shock and other things that went on. Or they have sustained brain damage related to what we’ve done, ligating vessels, putting catheters in, causing embolism, things like that. And of course, every case like that makes us worry and wonder, “Have we done this patient any favors; have we done the family any favors?”

In the early days of the neonatal ECMO research, we were worried a lot about that because we were ligating major vessels in the neck. We knew from laboratory experience and clinical experience that there was adequate collateral most of the time, but, we spent a lot more time in those days assessing collateral circulation and brain function than we do now. We ultimately learned it was usually safe. The incidence of some type of brain injury or neurodevelopmental injury, in the neonates on ECMO, for example, now is about 10 percent. Through controlled studies, we know that
that is lower than incidence in similarly ill infants who were not placed on ECMO, so we think it’s caused by the illness rather than the procedure itself.

DR. GROSFELD: Now that many of these children have survived a number of years, have there been studies to evaluate whether they have things like attention deficits and what kind of school performance might you expect from someone surviving an ECMO run?

DR. BARTLETT: The first patient was treated in 1975, so she’s now almost thirty years old. We followed her and all these other children as we go along. We’ve done a lot of neurological follow-up studies, both in our institution and elsewhere. These children have a higher incidence of school problems. Particularly if you study them in first grade, which is kind of the typical first testing period, and then again, maybe about the fifth grade. They do have a higher incidence of behavioral problems, learning problems, and so on than children who’ve never been sick. However, the incidence is the same in other children who’ve been in intensive care units. So that doesn’t relate to the ECMO procedure, per se, it just relates to really sick children. About 20 or 30 percent of them may have learning problems or behavioral problems when they get into school.

DR. GROSFELD: Now what about the nutrition of these children? You mentioned a little bit about how hemofiltration improved the nutrition of youngsters who were in renal failure. What about the children with the respiratory problems, who were on ECMO, did they need any special kind of feeding program? Did they need intravenous nutrition or were they able to tolerate feedings accordingly if their GI [gastrointestinal] tracts were working while they were on this therapy?

DR. BARTLETT: Partly through the ECMO-related research and the hemofiltration research, we’ve been studying the effects of nutrition and critical illness both in adults and in children and in babies. We find that sick people need to be fed. They need to be fed an appropriate energy source equivalent to their metabolic needs and an appropriate protein source to maintain growth, development and host defenses. That is all relatively new in the last forty years or so. First of all, the ability to do it and, secondly, the realization of how important it is. But, yes, we measure caloric requirements and protein balance frequently in these patients, and then feed them appropriately into their GI tract, if that’s possible. If it’s not, for any reason, then clearly parenterally.

DR. GROSFELD: If you had a choice, you’d probably want to use the GI tract, is that what you’re saying?

DR. BARTLETT: Yes, we always use the GI tract even if there’s a problem with a patient with ileus or peritonitis for example. We can still put
a small amount of tube feeding in to maintain the integrity of the intestinal mucosa. It has always been an issue. It still is an issue in the newborn infant, particularly the premature newborn, whether they’re on ECMO or not, whether enteric feeding predisposes in some way to necrotizing enterocolitis. Our practice still is to treat those children mostly with parenteral feeding rather than relying on full enteric feeding until they’re off the ventilator and healthy.

DR. GROSFELD: Dr. Bartlett, again, I want to congratulate you on your being awarded the Ladd Medal. It’s certainly one of the highlights in someone’s career to be recognized as someone in the surgical field who has contributed something very special. And indeed you have, and we certainly appreciate the opportunity of having a chance to ask you these questions and thank you for your taking time from your very busy schedule to share your experience with us and give us some insight into how all this began and bring us up-to-date.

DR. BARTLETT: Thank you, Jay. It’s been great fun.

DR. GROSFELD: That concludes the interview with Dr. Robert Bartlett, the 2003 William E. Ladd Medal winner.

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CURRICULUM VITAE

NAME
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BORN
May 8, 1939, Ann Arbor, Michigan

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PRESENT POSITIONS

Professor of Surgery, Sections of General and Thoracic Surgery, University of Michigan, Ann Arbor
Director, Critical Care, Section of General Surgery
Director, Surgical Intensive Care Unit
Program Director, Surgical Critical Care Fellowship
Program Director, Extracorporeal Life Support Program

MAJOR FIELD OF INTEREST

Applied Physiology in Surgery

ACADEMIC DEGREES

B.A. Albion College, Albion, Michigan, June 1960
M.D. University of Michigan Medical School, cum laude, June 1963

RESIDENCY

July 1963 – June 1967 Intern—Senior Resident in Surgery, Peter Bent Brigham and Children’s Hospital, Boston, Massachusetts
July 1967 – June 1968 Chief Resident in Thoracic Surgery, Peter Bent Brigham Hospital
July 1968 – June 1969 Chief Resident Surgeon, Peter Bent Brigham Hospital

FELLOWSHIP


TEACHING AND RESEARCH APPOINTMENTS

July 1969 – June 1970 Harvey Cushing Fellow, Peter Bent Brigham Hospital
Research Fellow in Surgery, Harvard Medical School
July 1970 – June 1973
Assistant Professor of Surgery, University of California, Irvine
July 1973 – June 1977
Associate Professor of Surgery, University of California, Irvine
July 1977 – June 1980
Professor of Surgery, University of California, Irvine
July 1980 – Present
Professor of Surgery, University of Michigan, Ann Arbor

LICENSURE

Diplomate, National Board of Medical Examiners
Massachusetts & California licenses expired

BOARD CERTIFICATION

American Board of Surgery, October 20, 1969
American Board of Thoracic Surgery, April 4, 1970
American Board of Surgery, Critical Care, April 9, 1987
American Board of Surgery, Critical Care Re-certification, October, 1996

HOSPITAL APPOINTMENTS

1969-70  Peter Bent Brigham Hospital, Assistant in Surgery
1970-80  University of California, Irvine (Orange County Medical Center)
          Attending Staff
          Assistant Director of Surgical Services, 1970-80
          Director, Burn Center, 1971-80
1970-80  St. Joseph Hospital (Orange, California), Attending Staff
          Children's Hospital of Orange County, Attending Staff
          Veterans' Hospital, Long Beach, Attending Staff
1980-85  Wayne County General Hospital and Westland Medical Center,
          Attending Staff
1980 -   Veterans Hospital, Ann Arbor, Attending Staff
1980 -   University of Michigan Medical Center
          Attending Staff 1980-
          Director, Surgical Intensive Care Unit 1980-
          General Surgery Section Head 1981-87
          Director, Graduate Education 1980-91
          Trauma/Critical Care Division Chief 1980-91
          Critical Care Division Chief 1991- 2002
          Program Director, Surgical Critical Care Fellowship 1991-
          Director, Extracorporeal Life Support Program 1980-
          Critical Care Committee Co-Chair 1995-
          Executive Committee on Clinical Affairs 1981-85, 2003-2005

SOCIETIES
Beta Beta Beta, Biology Honor Society  
Galens Honorary Medical Society, University of Michigan  
Alpha Omega Alpha, Medical Honor Society

**Surgical Societies**

- American Association for Surgery of Trauma  
- American Association for Thoracic Surgery  
- American College of Surgeons  
- American Pediatric Surgical Association  
- American Surgical Association  
- Central Surgical Society  
- Coller Surgical Society  
- General Thoracic Surgery Club  
- Michigan Chapter of American College of Surgeons  
- Michigan Society of Thoracic & Cardiovascular Surgeons  
- Society of Brigham Surgical Alumni  
- Society of University Surgeons  
- Surgical Biology Club II  
- Surgical Infection Society  
- Western Thoracic Surgical Association

**Other Societies**

- American Association for the History of Medicine  
- American Burn Association  
- American College of Chest Physicians  
- American Medical Association  
- American Physiological Society  
- American Society for Artificial Internal Organs  
- American Thoracic Society  
- American Trauma Society  
- European Intensive Care Society  
- Extracorporeal Life Support Organization  
- International Society for Artificial Organs  
- Society of Critical Care Medicine  
- American Institute for Medical & Biological Engineering (Charter Member)

**PROFESSIONAL ACTIVITIES AND APPOINTMENTS**

- Chairman, Program Committee, University Surgical Residents Meeting (1969)  
- Chairman, NHLI Workshop on Hematology and Extracorporeal Circulation (1974)  
- Chairman, Research Committee, Orange County Heart Association (1974-77)  
- Council, Society of University Surgeons (1975-78)  
- Education Committee, American Burn Association (1975-78)  
- Research Committee, California Heart Association (1974-75)  
- Chairman, Local Arrangements, American Burn Association (1977)  
- Co-Chairman, Postgraduate Course on Fluids and Electrolytes, American College of Surgeons (1977)  
- Program Committee, Michigan Chapter, American College of Surgeons (1981-1986)  
- Central Surgical Society, Membership Advisory Committee (1985-88)
American College of Chest Physicians, Council on Critical Care (1983)
American College of Surgeons, Pre and Postoperative Care Committee (1985-95);
CME Strategic Planning Committee 2001
American Board of Surgery, Examination Consultant, 1989-90
American Society for Artificial Internal Organs (ASAIO)
  Committee on Standards and Specifications for Gas Exchange Devices
    (1970-80)
    Program Committee (1974-78)
    Councilman at Large (1979)
    Chairman, Program Committee (1981, 1982, 1983)
    President Elect, 1983
    Publications Task Force, 1984
    President, 1984
    Executive Committee, 1985
    Board of Trustees, 1986-87
    Regulatory Affairs Committee, 1985-
    Senior Advisory Committee, 1999 –
    Project Bionics Co-Chair, 1999 –
International Society for Artificial Organs
  President Elect, 200
  President 2002-2003
Extracorporeal Life Support Organization (ELSO), Chairman, Steering Committee
  1989-94
The University of Michigan:
  The Faculty Senate Committee on the Future of the University, 1996-
    Chairman, Planning Committee of the University of Michigan Medical School
    Sesquicentennial Celebration, 1997-2001
    Medical School representative on the Senate Assembly, 1996-1999
    Member, Center for Biomedical Engineering Research, 1997-2000

HONORS AND AWARDS
University of California, Irvine, Student Teaching Award, 1978, 1979, 1980
University of California, Irvine, AOA Faculty Advisor, 1976-79
University of Michigan, AOA Faculty Advisor, 1982-85, 92-95
University of Michigan, The Victor C. Vaughan Society Faculty Advisor, 1984-
University of Michigan, Galens Medical Society Silver Shovel Award for Outstanding
Clinical Teacher, 1989
Gibbon Award, American Society of Extra-Corporeal Technology, Inc., 1992
Dwight E. Harken Award, Temple University, Philadelphia, 1992
Medal of Special Recognition, Swedish Medical Society, 1993
University of Michigan Kaiser Permanente Excellence in Teaching Award, 1993
Luther Longino Lecturer, University of Alabama, March 1994
American College of Surgeons Sheen Award for Research, 1996
Robert E. Gross Lecturer, American Pediatric Surgical Association, May 1996
University of Michigan, Galens Medical Society Faculty Advisor, 1997-99
Barney Clark Award from ASAIO, 1997
Medal of Special Recognition from the National Academy of Surgery of France, 1999
McGraw Medal of the Detroit Surgical Association, 1999
Robert E. Gross Memorial Lecturer, Boston Children’s Hospital and Harvard Medical
School, 1999
Robert Zollinger Lecturer, Ohio State University, 1999
Thomas Fogarty Lecturer, Stanford University, 2000
I.S. Ravdin Lecturer, American College of Surgeons, 2001
James “Red” Duke Lecturer, University of Texas, Houston, 2002
Hightower Lecture, Bowman Gray Surgical Society, 2002
Medallion for Scientific Achievement, American Surgical Association, April, 2002
NIH – Great Clinical Teachers Series, 2003
American College of Surgeons Jacobson Award, June 2003
Institute of Medicine of the National Academy of Science, 2003

EDITORIAL

Editorial Board:

Perfusion, 1985-
Critical Care, 1985-
ASAIO Journal, 1986-
Int. J. Biomaterials, Artificial Cells & Artificial Organs, 1987
Journal of Critical Care, 1988-1995
SESATS, Surgical Critical Care Subcommittee, 1990-1995
Artificial Organs, 1998-
Journal of Congestive Heart Failure & Circulatory Support, 2000-

Reviewer for:

Science, 1974; Chest, 1974 - 1979, 1983-
Journal of Applied Physiology, 1977 -
Heart and Lung, 1977-79
ASAIO Journal, 1978-
New England Journal of Medicine, 1981 -
Annals of Thoracic Surgery, 1981 -
Surgery, 1984 -
American Review of Respiratory Disease, 1985 -
The Journal of Thoracic and Cardiovascular Surgery, 1987 -
Artificial Organs, 1987 -
Intensive Care Medicine, 1987 -
Pediatrics, 1987 -
The Journal of Parenteral and Enteral Nutrition, 1988 -
Archives of Surgery, 1989 -
The Journal of the American Medical Association, 1993 -
American Journal of Respiratory and Critical Care Medicine, 1993 -

RESEARCH CONSULTANT/GRANT REVIEW

Utah Biomedical Test Laboratory, 1974, 1975
University of Michigan: Burn Treatment Study Project, 1979
NIH: National March of Dimes Foundation, 1974
California Heart Association, 1975
National Heart and Lung Institute, 1974, 1975
NHLI - Workshop on Mechanisms of Acute Lung Damage, 1977
NIH/NIGMS - Consensus Program on Burn Care, 1978, 1980
NIH, Clinical Cancer Program, Site Visit, 1980
NIH, Surgery Study Section Consultant, 1984, 1999, 2001
NIH, Medical College of Virginia, Site Visit, 1986
Study Section on Cardiopulmonary Bypass, 1990
SBIR Study Section, 1995-98
Study Section of Muscle Diseases, 2001
Study Section on Treatment of Shock, 2003
Study Section on Pediatric Life Support, 2003

United States Army:
  Consultant in Emergency Care, 1996-97

INVITED LECTURES

1970-79
International Conference on Membrane Lung Technology, Invited Speaker, 1975
Japanese Association for Thoracic Surgery, Honored Guest, 1977
Midwest Surgical Society, Harridge Memorial Lecture, 1978

1980-89
Oregon Thoracic Society, Conklin Lecturer, 1982
McGill University, Visiting Professor, Royal Victoria Hospital, 1982
Emory University, Atlanta, Visiting Professor, 1983
German Heart Center, Munich, Germany, Invited Speaker, 1984
Cleveland Clinic, Cleveland, Ohio, Visiting Professor, 1984
Symposium on CAVH, New York, Invited Speaker, 1984
American College of Surgeons, San Francisco, California, Invited Speaker, 1984
Aachen, Germany, Symposium on CAVH and Renal Failure, Invited Speaker, 1984
Hammersmith Hospital, London, England, Visiting Professor, 1984
Cleveland Clinic Foundation, Visiting Professor, 1984
Long Island College Hospital and the National Kidney Foundation, Invited speaker, 1984
MIEMSS Clinical Center, Baltimore, Visiting Professor 1985
Washington DC Children's Hospital National Medical Center, Visiting Professor, 1985
Cleveland Clinic, Invited Speaker 1985
2nd World Congress of Pediatric, Invited Speaker 1985
University of Minnesota, Visiting Professor, 1985
Orange County Surgical Society, Invited Speaker, 1985
Boston Children's Hospital, Harvard Medical School, Visiting Professor, 1985
Columbia Presbyterian Hospital, Visiting Professor, 1985
International Biomedical Engineering Symposium, Invited Speaker, 1986
Brigham and Women's Hospital Postgraduate Course, Invited Speaker, 1986
International Symposium on Continuous AV Hemofiltration, Vicenza, Italy, Invited
  Speaker, 1986
American College of Surgeons Spring Postgraduate Course, Invited Speaker, 1986
Japanese Artificial Organs Symposium, Tokyo, Japan, Invited Speaker, 1986
Perinatal Research Society, Phoenix, Arizona, Invited Speaker, 1986
American Academy of Pediatrics, Washington, DC, Invited Speaker, 1986
American Society of Parenteral and Enteral Nutrition, New Orleans, Invited Speaker, 1987
Third International Symposium on Acute Continuous Renal Replacement Therapy, Ft.
  Lauderdale, Invited Speaker, 1987
Episcopal Hospital & Temple University Medical School, Philadelphia, Visiting
  Professor, 1987
International Symposium on Cardiac Surgery, Rome Italy, Invited Speaker, 1987
International Congress on Intra-abdominal Infections, Hamburg, Germany, Invited
  Speaker, 1987
International Symposium on Extracorporeal CO₂ Removal in Patients with Severe ARDS, Invited Speaker, 1987
March of Dimes Medical Symposium, New York, Invited Speaker, 1987
California Thoracic Society, Yosemite, California, Invited Speaker, 1988
University of Rochester Medical Center, Rochester, NY, Visiting Professor, 1988
Cardiothoracic Surgery Symposium, San Diego, Invited Speaker, 1988
Scandinavian Association for Neonatal ECMO, Stockholm, Robert H. Bartlett Lectureship, 1988
4th European Congress on Intensive Care Medicine, Milan Italy, Invited Speaker, 1988
Japanese College of Surgeons, Tokyo, Invited Speaker, 1988
Children's Hospital of Pittsburgh, Visiting Professor, July 1988
University of Colorado, Visiting Professor, July 1988
Orange County Parent Care Conference, California, Invited Speaker, September 1988
Akron City Hospital, Visiting Professor, October 1988
American College of Surgeons Annual Meeting, Invited Speaker, 1988
McGill University, Visiting Professor, January 1989
Keesler Air Force Base, Visiting Professor, March 1989
Michigan State University, Visiting Professor, May, 1989
Detroit Medical Center, Visiting Professor, June 1989
American College of Surgeons Annual Meeting, Invited Speaker, 1989
Third International Steglitz Symposium, Berlin, Invited Speaker, October 1989
Orange County Surgical Congress, Invited Speaker, November 1989
University of Minnesota, Visiting Professor, November 1989
Ohio State University, Visiting Professor, December 1989
American Association for Respiratory Care, Invited Speaker, December 1989

1990-1999
Rush Presbyterian-St. Lukes Hospital, Regnery Visiting Professor, February 1990
Creighton University, Visiting Professor, March 1990
Japanese Society of Artificial Organs, Invited Speaker, September 1990
University of California, San Diego, Visiting Professor, March 1991
Dartmouth Medical School, Curts Visiting Professor, March 1991
Duke University, Visiting Professor, April 1991
Fourth European Congress on Extracorporeal Circulation, Amsterdam, Invited Speaker, June 1991
Hershey Medical Center, Visiting Professor, October 1991
San Francisco Trauma Conference, Invited Speaker, January 1992
University of Pittsburgh, Visiting Professor, January 1992
Pan Pacific Surgical Association, Hawai, January 1992
European Intensive Care Meeting, Milan Italy, Invited Speaker, May 1992
CECEC Meeting, Paris, France Invited Speaker, June 1992
Scandinavian Association of Thoracic & Cardiovascular Surgery, Oslo Norway, Invited Speaker, August 1992
Swedish Medical Society, Stockholm, Invited Speaker, 1992
Royal London Hospital, Mechanical Circulatory Support Meeting, Invited Speaker, March 1993
Pediatric Intensive Care Meeting, Padua, Italy, Invited Speaker, June 1993
International Society of Artificial Organs, Amsterdam, Invited Participant, July 1993
Intensive Care Society, London, Invited Participant, October 1993
University of Alabama, Visiting Professor, 1994
Italian Intensive Care Society, Milan, Italy, Invited Speaker, June 1994
European Intensive Care Congress, Brussels, Invited Speaker, March 1995
Mexican Society of Cardiopulmonary Bypass, Mexico City, Invited Speaker, July 1995
Ehrenhaft Lecturer, University of Iowa, October 1995
Italian Intensive Care Symposium, Ancona, Italy, Invited Speaker, March 1996
European Society of Anesthesiologists, London, Invited Speaker, June 1996
Far-Forward, Resuscitative Surgery Meeting, Washington, DC, Invited Participant by the Joint Staff, January 1997
University of Hawai, Honolulu, Visiting Professor, March 1997
University of Texas, San Antonio, Visiting Professor, January 1998
Los Angeles Children’s Hospital, Los Angeles, Visiting Professor, January 1998
Annual Scientific Meeting of the Scottish Intensive Care Society, Sterling, Scotland, Invited Speaker, January 1998
Pontificia Universita Urbaniana ECMO Symposium, Rome, Invited Speaker, February 1998
Southeastern ECMO Meeting (SEECMO) Keynote Speaker, Charleston, SC 1998
International Congress on Pediatric Pulmonology, Invited Speaker, June 1998
University of Pittsburgh, Invited Speaker, October 1998
Tiny Baby Conference, Orlando, Florida, February 1999
Society for Neonatology and Pediatric Intensive Medicine, Munich, Invited Speaker, May 1999
Ohio State University, Visiting Professor, September 1999
University of Toronto, Critical Care Medicine Symposium, Invited Speaker, October 1999
University of Florida, Invited Speaker, November 1999

2000–Present
UCLA, Visiting Professor, 2000
University of Maryland, Shock Trauma Institute, Visiting Professor, 2000
Oregon Trauma Symposium, 2000
Leicester Conference on Extracorporeal Life Support, 2000
Denver Surgical Association, 2000
Brooke Army Hospital Trauma Symposium, 2000
Rostock University, Artificial Liver Symposium, 2000
American College of Surgeons Young Surgeons Program, 2000
University of Pennsylvania, Visiting Professor, 2000
Stanford University, Visiting Professor, 2000
Boston University, Visiting Professor, 2001
Orange County Surgical Symposium, Keynote Speaker, 2001
Jersey City Medical Center, Visiting Professor, 2001
Leicester Conference on Extracorporeal Life Support, 2001
American Academy of Pediatrics, Surgical Section, Residents’ Conference Speaker, 2001
University of Texas, Houston, Visiting Professor, 2002
American College of Surgeons, Young Investigators Conference, Keynote Speaker, 2002
Pennsylvania State University, Ballantyne Centre, 2002
Bowman Gray Surgical Society, Hightower Lecture, 2002
Southeast ECMO Symposium, Keynote Lecture, 2002
SMART Italian Intensive Care Symposium, 2002
University of Calgary Surgeon’s Day Lecturer, 2002
International College of Surgeons, Guest Lecturer, Taipei, Taiwan, 2002
British Pediatric Cardiology Conference, Guest Lecturer, Leicester, England, 2002
University of Wisconsin, Visiting Professor, 2002
Academy of Cardiovascular Perfusion, Guest Lecturer, 2003
Dialysis Association of Argentina, Guest Lecturer, Mendoza, Argentina, 2003
Japanese ECMO Symposium, Keynote Speaker, Tokyo and Okayama, Japan, 2003
University of Florida, Visiting Professor, 2004
University of North Carolina – Chapel Hill, Visiting Professor, 2004

**PhD GRADUATE STUDENTS**

University of Michigan:
Kenneth Drake, Bioengineering, 1987
Arthur Oram, Bioengineering, 1988
Michael Morykwas, Bioengineering, 1988
J. Patrick Montoya, Mechanical Engineering, 1990
Scott Merz, Bioengineering, 1993
Nitin Kulkarni, Physiology, 1994
Sean Chambers, Bioengineering, 1998

University of Groningen, Franz Platz, 1992
University of Gothenberg, Karen Mellgren, 1998
Chiba University, Kenichi Matsuda, Medical Science, 2003

**UNITED STATES PATENT**

Autotransfusion System, Patent #4,547,186, October 15, 1985
Self Regulating Blood Pump, #5,222,880, June 29, 1993
Self Regulating Blood Pump Controlled Suction, #5,281,112, January 25, 1994
Self Regulating Blood Pump Controlled Suction, #5,342,182, August 30, 1994
Photo bioreactors and Closed Ecological Life Support Systems and Artificial Lungs Containing the Same, #08/412,598, March 25, 1997

**RESEARCH GRANTS**

Principal Investigator: Prolonged Extracorporeal Cardiopulmonary Support
Orange County Heart Association, 1971 ($2,433)

Principal Investigator: Membrane Oxygenator Development Project
Donald E. Baxter Foundation, 1970-71 ($37,000)

Principal Investigator: Prolonged Extracorporeal Respiratory Support.
California TB and Respiratory Disease Association,
1971-72 ($7,500)

Principal Investigator: Prolonged Extracorporeal Circulation,
National Institutes of Health, NHLI, 1972-75 ($286,868)

Principal Investigator: Clinical Prolonged Extracorporeal Circulation (contract)
<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Project Details</th>
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<tbody>
<tr>
<td>Burns: Surface Management.</td>
<td>National Institutes of Health, NHLBI, 1974-77 ($417,310)</td>
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<tr>
<td>Donald E. Baxter Foundation, 1974-75 ($24,350)</td>
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<tr>
<td>Principal Investigator</td>
<td>Prolonged Extracorporeal Cardiopulmonary Support</td>
</tr>
<tr>
<td>National Institutes of Health, NHLBI, 1976-79 ($241,724)</td>
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<tr>
<td>Burns: Surface Management.</td>
<td>National Institutes of Health, NHLBI, 1976-78 ($29,000)</td>
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<td>Extracorporeal Circulation for Neonatal Respiratory Failure</td>
<td>National Institutes of Health, NICHD, 1978-80 ($345,000)</td>
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<td>Burns: Surface Management.</td>
<td>National Institutes of Health, NICHD, 1979-80 ($20,000)</td>
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<td>Extracorporeal Circulation for Neonatal Respiratory Failure</td>
<td>National Institutes of Health, NICHD, 1981-84 ($559,295)</td>
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<td>Autotransfusion System Evaluation Thoratec, Inc., 1983 ($20,000)</td>
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<td>Nutrition in Trauma Mead-Johnson, 1983 ($15,000)</td>
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<td>Postdoctoral Training: Emergency and General Trauma Surgery, General Motors Corporation, 1984-85 ($55,000)</td>
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<td>NIRA: Accelerated Synthes and Testing Living Skin Equivalent</td>
<td>National Institutes of Health, 1984-85 ($36,650)</td>
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<tr>
<td>Extracorporeal Circulation for Neonatal Respiratory Failure</td>
<td>National Institutes of Health, NICHD, 1984-85 ($231,980)</td>
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<tr>
<td>Extracorporeal Circulation for Newborn Respiratory Failure</td>
<td>National Institutes of Health, NICHD, 1985-90 ($1,200,000)</td>
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</table>
| Principal Investigator | Extracorporeal Circulation in Pediatric Respiratory Failure  
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<tr>
<td></td>
<td>National Institutes of Health, NICHD, 1990-92 ($1,094,115)</td>
</tr>
</tbody>
</table>
| Principal Investigator | A Registry of Extracorporeal Life Support  
|                        | William Randolph Hearst Foundation, 1989-93 ($120,000)           |
| Principal Investigator | Extracorporeal Membrane Oxygenation in Respiratory Failure, National Institute of Health, 1993-1997 ($1,165,839) |
| Principal Investigator | Extracorporeal Life Support in Military Casualties, Department of Defense, 12/1/96-12/30/99 ($1,470,195) |
| Principal Investigator | Extracorporeal Life Support in Multiple Organ Failure, National Institutes of Health, 1998-2003 ($1,919,988) |
| Principal Investigator | A Phase II Study to Determine the Efficacy and Safety of LY315920 in Patients with Severe Sepsis  
|                        | PPD Pharmaco 12/15/98-12/15/00 ($321,933)                          |
| Co-Investigator        | Total Liquid Ventilation: A Bioengineering Partnership  
|                        | National Institutes of Health, 12/1/99-11/30/04 (approx. $4,000,000) |
| Principal Investigator | Development of a Total Artificial Lung, National Institutes of Health, 1RO1 HL69420-01 2/1/2002-12/31/2006 ($4,964,682) |
| Principal Investigator | Extracorporeal Circulation without Anticoagulation, National Institutes of Health, RO1 HD015434-22 7/1/2004-6/30/2007 (approx. $1,600,000) |

**BUSINESS/CONSULTING**

**Active (2003):**
Michigan Critical Care Consultants, Inc., Ann Arbor, Michigan
Co-founder
A bioengineering/critical care R&D company
Accumed Systems, Inc., Ann Arbor, Michigan
   Scientific Advisory Board
   Invasive cardiology devices
Sensors for Medicine and Science, Germantown, Maryland
   Scientific Advisory Board
   Implantable chemical sensors
Therox, Inc., Costa Mesa, California
   Scientific Advisory Board
   Supersaturated oxygen
Teraklin, Inc., Rostock, Germany
   Scientific Advisory Board
Alliance Pharmaceutical Inc., San Diego, California
   Ad Hoc Consulting
Food and Drug Administration, Washington, DC
   Ad Hoc Consulting

Inactive:
Abbott Critical Care Systems, Mountain View, California
   Critical Care Advisory Board
   Management of critically ill patients
Baxter (Bentley Labs), Irvine, California
   Consulting Agreement
Mallinckrodt, St. Louis, Missouri
   Ad Hoc Consulting
Avecor Cardiovascular, Minneapolis, Minnesota
   Ad Hoc Consulting
Medical Device Consultants, Inc., North Attleboro, Massachusetts
   Ad Hoc Consulting
ICOR, Stockholm, Sweden
   Ad Hoc Consulting
Ortho Biotech, Inc., Raritan, New Jersey
   Consulting Agreement
Instrumentation Labs, Lexington, Massachusetts
   Scientific Advisory Board

RHB/cim
University of Michigan Medical Center
General Surgery
2/04
**BIBLIOGRAPHY**

**Books and Monographs**


Chapters


Book Reviews


Scientific Publications


38. Fong SW, Burns NE, Williams G, Woldanski C, Gazzaniga AB, Bartlett RH: Changes in coagulation and platelet function during prolonged


313. Zhang H, Annich GM, Miskulin J, Osterholzer K, Merz SI, Bartlett RH, Meyerhoff ME: Nitric Oxide releasing silicone rubbers with improved


333. Meinhardt JP, Annich GM, Miskulin J, Kawai T, Ashton BA, Bartlett RH: Thrombogenicity is Not Reduced When Heparin and Phospholipid


Publications from Dr. Bartlett’s Research Teams


Papers in Press


