SCA Oral History Series

Interview of Dr. Edward Lowenstein by Drs. Glenn Gravlee and Michael Fitzsimons

Interview 1: April, 2025

SCA is pleased to present an Oral History interview of Ed Lowenstein, who co-invented opioid-based anesthesia for cardiac surgery in the late 1960s. The interview was carried out in two separate sessions in mid-2025 by Glenn Gravlee, Professor Emeritus of Anesthesiology at University of Colorado School of Medicine, and Michael Fitzsimons, Vice Chair for Faculty Development at Mass General Brigham Department of Anesthesiology. Dr. Lowenstein is Emeritus Henry Isaiah Dorr Professor of Anesthesia at Harvard University School of Medicine. He was the first Chief of Cardiac Anesthesia at Massachusetts General Hospital and subsequently served as Anesthesiologist-in-Chief at Beth Israel Hospital. Both are Harvard Medical School hospitals in Boston. Dr. Lowenstein recalls that era of cardiac anesthesiology and also tells the compelling stories of his childhood escape from Nazi Germany in the late 1930s and his journey from boyhood in Cincinnati to distinguished anesthesiology professor at Harvard.

Dr. Glenn Gravlee

I'm Glenn Gravlee, a Professor Emeritus of Anesthesiology at the University of Colorado and I'm here with Mike Fitzsimons. Mike, do you want to give yourself a little introduction?

Dr. Michael Fitzsimons

Yeah, I'm Mike Fitzsimmons. I'm Vice Chair for Faculty Development at MGB (Ed: Mass General Brigham), Department of Anesthesiology, and the former director of the Division of Cardiac Anesthesia at Massachusetts General Hospital.

Glenn Gravlee

And we're here to interview Ed Lowenstein in the form of an oral history, who is a professor emeritus, I assume, at Harvard University. Anything else, Ed?

Dr. Edward Lowenstein

Yeah, I'm the Emeritus Henry Isaiah Dorr Professor of Anesthesia, and I was the first Chief of Cardiac Anesthesia at MGH. And then I became the Anesthesiologist in Chief at Beth Israel Hospital, which is another Harvard teaching hospital, eventually.

Glenn Gravlee

Excellent. Well, I think you had some prepared words you wanted to start with.

Edward Lowenstein

It was amazing as well as rewarding and energizing at the age of 90 to be contacted about work performed a generation ago. My first response is to describe my role. My mentor, leader, and and inspiration was Myron B Laver, a European immigrant, as am I. I like to think that our generation of immigrants was productive, and to note that the United States has been a nation of immigrants now for several hundred years.

At present, about one fifth of U.S. residents were foreign born. Thus, the present rise of xenophobia seems unwise to say the least. The work that led to our studies was performed in the isolated dog heart by Vasco and Henney (Ed note: 1 Feb 1966, https://doi.org/10.1152/ajplegacy.1966.210.2.329). They observed and concluded that morphine administration did not affect myocardial contractility. Our studies performed in adult humans with valvular heart disease and myocardial dysfunction consisted of injecting small increments of morphine intravenously to a total of 1 mg/kg.

This would have been considered a dangerous or fatal dose previously. While we injected, we urged, which could be translated as shouted at, the patients to breathe, as morphine otherwise would have stopped their breathing. During this time we measured blood pressure, heart rate and cardiac output, and sometimes central venous pressure. Unlike with inhalation anesthesia, cardiac output was maintained or increased. Low doses of the inhalation anesthetic thereafter were well tolerated, and the dangerous period fraught with anxiety for the entire medical staff became routinely calm.

It became routinely calm as induction, incision, sternotomy, and cardiac cannulation became routinely uneventful. High narcotic doses also permitted postoperative toleration of endotracheal tubes as patients could be ventilated and lungs expanded without atelectasis and hypoxemia, and without a tracheostomy postoperatively. It therefore also greatly benefited the postoperative course of these patients.

It is crucial to mention that morphine, particularly if injected rapidly, could release histamine. Therefore, Ted Stanley at the University of Utah thereafter used fentanyl instead of morphine (Ed note: Anesth Analg 1978;57:411-416, ISSN 00032999), and fentanyl and its analogs replaced morphine as the vehicle for narcotic anesthesia. The anesthetic and surgical advancements led to increases in cardiac surgical volumes and the development of coronary artery surgery led to explosive growth.

Incidentally, I had served as a rotating intern at the University of Oregon after graduating from University of Michigan Medical School and spent a month on Albert Starr's service, completely overwhelmed and

not having the slightest idea of what was going on in cardiopulmonary bypass and cardiac surgery in those days. One more reflection is that a subspecialty of anesthesia for cardiac surgery and for patients with heart disease was completely unimaginable in those early days. Its development, presence and strength is a consequence of hard, imaginative work by a myriad of individuals from all around the world, as reflected in the establishment of the Society of Cardiovascular Anesthesiologists. I can recall a number of instances when I was a young anesthesiologist and mentioned that I was concentrating on anesthetic management of patients with heart disease, and it was becoming my subspecialty. This often evoked disparagement and laughter and disbelief that such a turn would ever happen.

Michael Fitzsimons

So, what years were you talking about here? Because you published your article in I think 1972, right? (Ed note: Lowenstein E et al.: NEJM 1969: 281: 1389-93)

Ed Lowenstein

Well, I graduated from medical school in 1959. And then I spent, I think, a total of close to five years in training and in the Army. So that's about ‘65. And when I came back, I started doing this in probably the late ‘60s.

Glenn Gravlee

Ed, the study that came out in 1969, which I just reviewed this morning, indicated that this technique that you were doing on a dozen patients or so, some of whom weren't having heart surgery, but I think most of them were, had been done on 1100 patients before that. So if you build in the time for manuscript preparation, submission, responses, and publication, we're talking about going back probably to ‘65 or ‘66, that you were doing this pretty much routinely at MGH. Does that sound about right?

Edward Lowenstein

We were certainly doing it at that time. And we were getting going with it and doing it more and more, both because cardiac surgery was becoming much more common and because, we were using this rather than other methods.

Glenn Gravlee

Do you think it was spreading to other centers before the publication of the 1969 article?

Edward Lowenstein

We talked about it a little bit, but I think mostly it evoked disparagement. I think people were very reluctant to do this. They were concerned about giving these large doses of morphine for a number of reasons.

Michael Fitzsimons

Dr. Lowenstein, what were they using instead of morphine? What was the anesthetic at the time?

Edward Lowenstein

Halothane.

Glenn Gravlee

With little bits of Demerol, morphine, nitrous as well, or pretty much just halothane?

Edward Lowenstein

Nitrous/ halothane was the major one. They were mostly being put to sleep by thiopental - Pentothal. And then start nitrous oxide and halothane, and away you go. And the advantage, of course, is that halothane was not explosive. Morphine (Ed note: he means diethyl ether), you know, always had the worry, if you were going to use electrocautery that, there would be a fire or an explosion.

Glenn Gravlee

Elaborate for us a little bit, Ed, on the the comment “fraught with anxiety” during cannulation, sternoromy and so on. What was causing the anxiety?

Edward Lowenstein

Well, these were patients with severe heart disease and giving them myocardial depressants, which all anesthetics, all classical anesthetics, are, could exacerbate that. And they could either have hypotension, severe hypotension, and, or cardiac arrest. Those were the hazards.

Michael Fitzsimons

So Ed, we often hear about with halothane, how arrhythmias could occur. Was this something that you observed commonly at the time?

Edward Lowenstein

I don't have a good answer for that. I think that, being honest, I think we probably observed arrhythmias, probably accepted them, and were pleased that we weren't going to be blown up.

Michael Fitzsimons

Ed, how did you monitor the patients back then? You mentioned earlier blood pressure, EKG, central lines occasionally. You know, what was it like? For instance, what was the arterial line monitoring? What was the setup like?

Edward Lowenstein

Right. This was a very big deal in those days, putting in an arterial catheter, and one of the surgeons used to do that by cut down. And someone in our group, I forget whether it was me or someone else figured out we can just stick in an arterial needle - an arterial catheter.

I'm trying to remember the name of the small catheter, which was about two or 2.5 inches long and had a needle in it. Do you guys remember?

Glenn Gravlee

The Medicut?

Edward Lowenstein

It's possible, but I don't remember. But we just started trying to stick that in the artery. And pretty soon we were doing it on every case, and the surgeons were happy enough not to do the cut down. And we were happy because we could stick it in and then not have to wait for anyone and monitor the patient in the induction room.

Glenn Gravlee

And before that, you were just using cut downs with the, what was it, the Richardson needle kind of thing?

Edward Lowenstein

I don't remember anything about a Richardson needle, but yes, we would put the patient to sleep, without any intravascular monitoring. And then the intravascular monitoring would be put in by a surgeon. I think

it gave us a certain amount of pride to be able to stick an arterial line and a central venous catheter without the surgeons being around. It meant we could start earlier, whenever we wanted, and meant we didn't have to depend on them to do it.

Michael Fitzsimons

So at this time, we didn't have automated blood pressure cuffs. So I assume this management of, or monitoring via blood pressure was just with auscultation.

Edward Lowenstein

Absolutely. Sure.

Michael Fitzsimons

Well, and then EKG, was that a standard monitor by that time?

Edward Lowenstein

I'm pretty sure. Well, you mean for noncardiac surgical patients or both? I'm pretty sure it was not standard for nonsurgical cardiac surgical patients, but we started it and I remember this huge, huge Hewlett Packard machine. I don't know if you guys ever saw it. They're about 6 or 7 feet tall and maybe 30 inches wide and 30 inches deep.

And they had a hot kind of a stylus on it. And that's how we monitored the patients and collected paper records of the actual recordings, which were, of course, much more accurate than what we would put down on the anesthetic record.

Glenn Gravlee

But you did have the oscilloscope tracing as well, right?

Edward Lowenstein

We had the oscilloscope tracing.

Michael Fitzsimons

So, Ed, opioid-based anesthesia for cardiac surgery persisted for 40 years. More than 40 years. And then we started to change our focus a little bit towards maybe some earlier extubation, lower-dose opioids.

Was there anything that you saw early on in your practice that made you, you know, think, is there a different way of doing it other than opioids? Was there anything that actually, you know, concerned you at the time?

Edward Lowenstein

Again, I'm not sure. But my recollection is we were so exhilarated by the fact that, not only was this period which had been fraught with anxiety, the induction of anesthesia, not only was that not an issue anymore, but that we could think about and perform postoperative ventilation without doing a tracheostomy.

And again,because the patient would tolerate the endotracheal tube. And that seemed to us and I think probably was just a major advantage because the early extubation of a patient, after cardiac surgery, at least in those days where sternotomies were used, etc., was hazardous and by being able to breathe for them for until they could really maintain their ventilation well and keep their lungs expanded, just filled us with great delight.

Michael Fitzsimons

Did you see people translate this technique into other anesthetics, or did it induce confidence in the ability to manage patients with heart disease for other procedures that normally would have been considered very difficult or very dangerous?

Edward Lowenstein

Yes, certainly we did that for patients with valvular heart disease. And I think other people adopted this at times, maybe not as frequently as we did, to avoid the problems that they could get into with inhalational anesthetics. I do remember one instance when I was a visiting professor at the Mayo Clinic and the chief of cardiac anesthesia,

pardon me, the chief of cardiac surgery, whose name all of us knew at one time, I've forgotten it, and he came to a presentation that I made. And he really was upset that this technique, which was not used at the Mayo Clinic at that time, I think largely because he didn't want it to be used, would require postoperative ventilation, as experience and thought led him to believe that postoperative ventilation was more of a hazard than a benefit.

Michael Fitzsimons

You know, Ed, you mentioned the amazing contributions of immigrants to the United States, both back then and now. Can you just briefly tell me about, you know, about your early life and immigrating from soon-to-be-at-war Europe over to the United States?

Edward Lowenstein

Sure. I'd be happy to. I was born in Duisburg. Germany. My father was one of four brothers. who were sons of a physician, Joseph Lowenstein. Two of them became physicians and two became lawyers. My father was one of the lawyers. When he came to this country, of course, he couldn't practice law without going to law school again, and he became an accountant. His youngest brother, whose name was Ernst – Ernest, graduated from medical school in Germany, I think in 1936, came to this country, spent a year of post-graduate training at Mayo Clinic and a year at Cincinnati General Hospital, which is the University of Cincinnati's hospital. And he liked Cincinnati. There were lots of German immigrants there.

And he said, okay, I'm going to stay here and practice. Well, there was only one little problem with that, and that was that Ohio did not recognize German medical training and degrees and papers. And so he got into his car and he started west. And when he crossed the Illinois state line after going through Indiana, he came to a little town named Mount Carmel.

It was spring, and he was on a street called Cherry Street, and the cherry trees were in bloom. And he said, boy, this really seems nice. And he settled there. He became one of seven physicians there. There was no hospital there. The nearest hospital was in Evansville, Indiana, which I think was 50 miles away. And he became an extremely fast driver going back and forth several days a week, terrifying many people who went with him, though he never had an accident. I went to medical school to be a general practitioner just like him. He was tall. My father was short. He drank highballs. My father drank beer. He belonged to the Elks Club. We belonged to nothing.

I forget why I said that, and, oh, and I wanted to be a physician like him. I went to undergraduate school at the University of Cincinnati. I had gone to a really spectacular college preparatory public high school in Cincinnati, which is still going strong. Name of Walnut Hills Junior High School and High School and I was a middle-of-the-road student there, went to the University of Cincinnati and was first in my class for a year or two.

And therefore, I was a pretty good candidate to get into medical school, which at that time was pretty difficult. And there were Jewish quotas at that time, and I applied to Western Reserve, University of Michigan and the University of Chicago. I was told by Harvard that they would not accept an application to evaluate me unless I had a bachelor's degree, and I was not willing to wait another another year to do that, despite the fact that I had had two physicians when I was very sick who had gone to Harvard Medical School, and they told me how wonderful it was.

Let’s see, what else am I answering?

Michael Fitzsimons

No, that's wonderful, just to know that. And I know that you mentioned your story about, you know, early on in your life immigrating over from Germany to the United States, right before, the start of World War II, is that right?

Edward Lowenstein

Right. Well, what happened, was my brother and I were on something called the Kindertransport, the children's transport. And England had agreed to accept 10,000, Jewish children to protect them from the persecution that they were getting in Germany and Czechoslovakia from the Nazis. And my brother and I were scheduled to go.

I was stupid enough to get appendicitis and Jews were not allowed in hospitals in those Hitlerian days. And apparently my operation was performed in my doctor grandfather's kitchen by a surgeon, who had agreed to do it. After that, I followed my brother from Germany to England, and we were taken care of by a single lady, named Ruth Stern, who I read was the headmistress or principal of a small school. Locksheed Council Elementary School, and she would go there every day on her bicycle. While we were there, she wheeled her bicycle, and we went along with her. Although I was not old enough to really start school, they stuck me in some classroom, and I guess I did learn a little bit. So we were there for a year and a half, and then by that time, my parents had gotten out of Germany, and we have no idea how they were able to do that because the Nazis were not letting Jewish people out of the country. What we did discover after my father died was that they left from Genoa, Italy. So somehow they got from Germany to Genoa, Italy, got on a boat, and they came directly to the United States.

Glenn Gravlee

So this would have been late ‘30s, Ed?

Edward Lowenstein

Yes, this was ‘38 and ‘39.

Michael Fitzsimons

I'm not sure we asked the question about the early cases that we were doing. I mentioned that, you know, we weren't doing that many CABGs, but I don't think we asked that question. Should we go back and tackle that maybe? Or not? I mean, because it's not really opioid-related.

Glenn Gravlee

Well, I guess the question might be how did this translate into the CABG population, as things evolved going into the ‘70s maybe. That seems fair.

Edward Lowenstein

That's probably worth doing because morphine anesthesia is not particularly good for patients with coronary disease, as you want to depress their contractility. And I think making that distinction is something that should be included somewhere in this.

Michael Fitzsimons

Glenn, do you want to ask that question?

Glenn Gravlee

Well, yeah. Ed, how did this high-dose narcotic technique translate into the coronary artery bypass population, which came along, you know, a few years after you had published this seminal article?

Edward Lowenstein

The advantage of morphine was that it did not depress myocardial contractility. The hazard that patients with coronary artery disease present is that if their contractility increases, they may and often do become hypoxic, myocardially hypoxic, and they can have heart attacks from this. So once coronary artery surgery became common, it was important to have an anesthetic which would prevent that and which would depress, to a good extent, myocardial contractility, and that led away from morphine and as coronary surgery became more than the predominant but almost the only surgery that was done, morphine anesthesia or narcotic anesthesia declined in frequency. And I should say that I think that fentanyl was better in patients like that than morphine was.

Glenn Gravlee

Because...

Edward Lowenstein

It seems to be powerful enough that it can work ,for whatever reason, maybe by preventing the pain better, to prevent the patient from becoming hypertensive.

Glenn Gravlee

You know, Ed, I'm not sure this necessarily needs to translate into the recordings, but, I think I relayed the story to you some years back, but when I was at Wake Forest, Ted Stanley came as a visiting professor and was demonstrating his application of the high-dose fentanyl technique, which we had been using in the operating room considerably already. And, we had this 45 year old strapping North Carolina, beer swigging, smoking, you know, 220 pound man built like a linebacker. And it just turned out that the high-dose fentanyl technique, no matter how much you gave, just wasn't enough to deal with his hypertension on incision, which none of us were surprised at, but that brings in the potential limitations to the opioid-

based technique, that at some point you're going to have to either add a vasodilator or some inhalational agent to deal with these big North Carolina Bubbas.

Edward Lowenstein

Right.

Michael Fitzsimons

Ed, what did you use at the time, knowing that some patients were more on the hypertensive side, what sort of vasopressors or vasodilators did you use to manage these patients, or did you?

Edward Lowenstein

Boy, I'm trying to think if we used anything other than inhalation anesthesia and I honestly don't remember. I think that's primarily what we did.

Glenn Gravlee

How about nitroprusside?

Edward Lowenstein

I think it took a while before we used nitroprusside. I'd have to look at dates. I'm sorry. My history and recall is not good enough.

Glenn Gravlee

I remember when I was a resident/fellow in the late '70s at MGH, we were we were at the leading edge of the nitroglycerin infusion trend, and it was literally being made from powder into a liquid, as you recall. I mean, there was no commercially available nitroglycerin infusion at the time. So I don't know when that came on board, but my thought was probably the early' 70s, something like that.

Edward Lowenstein

Yeah. I'm sorry, I can't really give you a good answer.

Michael Fitzsimons

Ed, I have a question. And this more relates to some research and work that I do with my academic career. Did people talk very much back then about opioid abuse by anesthesiologists or other physicians, or was it just not something that we saw at the time?

Edward Lowenstein

Well, let me think about morphine. Doctor Beecher, as you know, or maybe don't know, but Doctor Beecher with a PhD named Gene Smith did a huge number of studies on morphine., which were supportive of of its use for pain. They had a big pain project, which probably was the first and largest NIH project that that Beecher ever did.

They were aware that people became addicted, but I don't think they worried about that much in their studies and exactly why that is and whether they should have or not, I think is a long discussion.

Glenn Gravlee

I think we had, even when I was in residency, the occasional person drop out for a while for treatment because of opioid abuse. So I know it was around certainly by the ‘70s and probably earlier, but I doubt if it was anywhere near as common as it ultimately became.

Edward Lowenstein

Yeah, I don't ever recall a resident that I trained with becoming addicted. Not, well, that I knew that a resident (was addicted). But I think people were worried about it, I think some people were concerned about it, maybe not as concerned as they should be.

Michael Fitzsimons

Ed, how did you obtain the morphine? Was was there a pharmacy? Was it just - were there anesthetic carts? Where did the morphine come from?

Edward Lowenstein

Well, that's a great question. I have no idea. I think there was a pharmacy, a pharmacy desk, I think somewhere on the operating room floor where you could get drugs. But I'm not sure if if we got our narcotics there or we got them elsewhere or somebody got them for us, whether we would just say, I need, you know, “I need 100 mg of morphine” and someone would come along and give you a syringe with 100 mg of morphine

Glenn Gravlee

Well, in the late ‘70s, anyway, we just got it out of the work room, Ed, there was a little closet in the workroom.

Edward Lowenstein

In the MGH?

Glenn Gravlee

Yeah. And I don't think for the main part of the workday, it was even locked. And I remember, Carl Rosow and I shared a locker, and we would have little vials of morphine and Demerol right in the locker. And when we'd be changing clothes at the same time in the morning, you know, I'd say, is this your morphine, Carl, or is this my morphine? So we would just, even at the end of the day, what we had left over, we'd just stick it in our locker, and that was the end of it.

Michael Fitzsimons

Ed, so I want to ask another question just to go back again. So what were the early cases, early cardiac surgical cases that were performed around the time these this work started? And then as it evolved into the 1970s.

Edward Lowenstein

I think it was some adult congenital heart surgery. I'm trying to remember if Hardy Hendren was there and he may have done a little bit of pediatric congenital surgery, but not for long, if he did it before he moved. Well, mitral valve disease and aortic valve disease were the two big things, stenosis and insufficiency. And I think those were very much the predominant lesions.

Michael Fitzsimons

And at the time, replacement was done preferentially over any repairs. Is that right?

Edward Lowenstein

No, it started with mitral splits for stenosis. Before there were (at least at MGH) any replacements. I'm trying to think, since Starr was doing them in Oregon in 1960 when I was there. I'm not sure. I guess it took that long to travel east. It’s 3000 miles after all.

Glenn Gravlee

I remember some surgeons who did the mitral splits off pump. You probably do as well, Ed.

Edward Lowenstein

Oh, yeah, that had nothing to do with cardiopulmonary bypass. Throw ‘em in there, anesthetize them, open the the chest, finger would go in, you were done.

Glenn Gravlee

Was there an effort at venous occlusion to interrupt the caval blood flow to drop the venous return? Do you remember?

Edward Lowenstein

What I recall is they did a - what's it called when you do a suture around that you can stick your finger through in the left atrium? And then they wiggle the finger.

Glenn Gravlee

Purse string.

Edward Lowenstein

Correct. The purse string suture. Make a stab through that, finger would go in, wiggle it around for a while, and then the finger would come out, the suture would be drawn together and the situation evaluated. And they either needed another manipulation with the fingers or it was just closed up.

It’s fun to recall those things. Not in my everyday thoughts. I'm sure I want to thank you all once again for thinking of me in this, and then for helping me so much to try to do it with you.

Interview 2: June 10, 2025

Edward Lowenstein

As a resident, I was not interested in cardiac surgical anesthesia, which was led by Phillips Hallowell and performed also by Mike Laver, my primary role model and mentor, whose primary interests were developing and using blood gas measurement via the acute care laboratory he started and led. I returned to MGH after two years in the U.S. Army Surgical Research Unit in Fort Sam Houston, Texas, because MGH seemed the best United States anesthesia department to me.

The others were Columbia, led by Manny Papper, Penn, led by (Robert) Dripps, and, the University of Iowa, led at that time by Stuart Cullen, who went on to start (an anesthesiology department at) UCSF. However, after I arrived, it seemed to me that taking care of cardiac surgical patients during and after operation and eventually prior to operation was the most challenging, exciting opportunity and could make a greater impact on recovery and survival.

This was before coronary artery surgery had even developed, so it was mostly for valvular surgery as a consequence of rheumatic fever, which left after antibiotics were developed. As I spent more time on this, others wished to do it and we offered residents opportunities to spend first six months and then a year with us, the us being Mike Laver, John Hedley-White and Brian Dalton and me, I think, including some who spent time after completion of residency and became the first fellows in cardiac anesthesia. There was a moderate amount of derision and controversy about this as adult cardiac surgery was considered by some, or maybe by many, as a dying field, since rheumatic fever was disappearing with antibiotics and coronary surgery was in its infancy, and was not really considered a very promising area. Needless to say, coronary artery disease and coronary artery surgeries upended this situation. Most of the attendees of this session do not remember, and indeed were not alive when coronary disease was not a major or the major cause of death in the Western world.

In terms of forming a group, no one else was really interested in doing that. I suggested those of us who took care of cardiac patients meet I think monthly, and I think early Friday mornings, to plan experiments, consider research projects, and plan. I don't even remember if these meetings were in Mike Laver's office or in the anesthesia conference room. I thought Laver would lead it, but he declined and the rest suggested I lead the meeting, so I agreed rather reluctantly. I believe I came up with the name Cardiac Anesthesia Group, and that stuck for a long time. With respect to a fellowship, it seems, at least in retrospect, rather organic. Initially, some residents wanted to spend additional rotations, get additional experience, and assume more responsibility.

We wished to offer this and to differentiate those who were taking time in addition to the two years of residency by calling them fellows. I think that officially they were at least initially third year residents.

With respect to the formation of the ACA (Association of Cardiac Anaesthetists), my memory is deficient. Our ambition was quite limited. Beecher was disinterested. We wondered about publishing a chapter or a book, and we eventually did publish a chapter in a book on anesthesiology, organized and edited by Dick Kitz, We published articles in Anesthesiology, A&A, New England Journal of Medicine, etc.. Joel Kaplan at Penn, encouraged by Dripps, organized a new journal, the Journal of Thoracic and Cardiovascular Anesthesia, and they did a superb job in establishing the field.

The first leader of cardiac surgery (at MGH) was Gordon Scannell. This was before cardiopulmonary bypass at MGH, and operations were mostly on mitral and aortic stenosis, the former a consequence of rheumatic fever and the latter from age and calcification. The next leader of cardiac surgery was W. Gerald or Gerry Austin, who had spent two years at the National Heart Center of the NIH. He was a true gentleman, gently guided surgical residents and treated all, including anesthesiologists, respectfully.

Glenn Gravlee

Okay, I have a couple of questions on what you spoke about. First of all, could you clarify for us who Beecher was?

Edward Lowenstein

Henry K. Beecher was the first Henry Isaiah Dorr Professor of Anaesthesia at the MGH. He was an extraordinarily imaginative guy. And among his works were establishing the range in which placebos could really effect people's well-being and health.

Glenn Gravlee

And you said he was not terribly supportive of the concept of a cardiac anesthesia subspecialty. Am I interpreting that correctly?

Edward Lowenstein

Well, he was not interested in it. When I was there, he was in his latter days, and and I would say declining days, and he was so interested in his own work that he really passed the business of organizing the department on to - and the person who did that when I was there was- Henrik Bendixen, who was a an immigrant from Denmark. And just a tremendously talented person, very easy and good person to deal with, a tremendous leader who really ran the department and then I think he next went to the University of California, San Francisco, (Correction: University of California, San Diego) as the first chief of anesthesia. and if I'm not incorrect, he ended up as chairman at Columbia.

Glenn Gravlee

I think that's correct. Mike, did you have something?

Michael Fitzsimons

Yeah. Ed, this is fascinating. Nowadays, when we're assessing patients with valvular disease, we use ultrasonography. How did surgeons, you know, two questions here. One is were most of your valve procedures valve replacements or were they valve repairs? And how did the surgeons assess a valve repair or replacement after the procedure was done, because they didn't really didn't have ultrasound back then?

Edward Lowenstein

Oh, that's certainly for sure. When I started, mitral valvulotomy for mitral stenosis was I think by far the leading operation which was done. It was done with the surgeon's index finger, going through the valve and splitting it, which was called a mitral split. And they judged how good it was with that same index

finger and hoped that they had not caused too much mitral insufficiency. If they did that, the operation didn't work very well and the patient was doomed not to live particularly long. If the mitral valvulotomy/split, was ideal, the person could really live a pretty good life. Most or maybe all of these patients, I think, had atrial fibrillation. I can't recall that any of them came to operation while they were still in sinus rhythm.

Glenn Gravlee

Ed, did you did you use pressure gradients across either the mitral or aortic valve or the waveforms to assess the adequacy of the operation at that time? Do you remember?

Edward Lowenstein

I'm trying to remember when that came in. Certainly it was not at the beginning. I think, eventually, I was still practicing when we did that, but I don't have good recollection of it.

Michael Fitzsimons

And was the approach to the mitral valve tthrough the left atrial appendage or through the apex of the heart?

Edward Lowenstein

Definitely through the left atrial appendage.

Michael Fitzsimons

Wow, okay. And do you remember, Ed, early on, we know that a lot of cardiac surgery was really on congenital heart disease and acquired disease - the aortic valve, the mitral valve. When at Mass General did they actually start doing coronary surgery? We know that the first coronary surgeries were reported out of the Cleveland Clinic in ‘68. But when did they start doing it at Mass General?

Edward Lowenstein

I couldn't tell you really very accurately. I'm sorry.

Michael Fitzsimons

No, that's all right.

Glenn Gravlee

Well, I can tell you that I was there as a medical student on rotation with something called an ASA preceptorship in ’72, and it was certainly going by that time. So, you know, I don't know how much before that it got going, but my guess would be no later than 1970.

Edward Lowenstein

That sounds reasonable to me.

Glenn Gravlee

Ed, I think you mentioned Mike Laver, John Hedley-White, Brian Dalton as part of the early cardiac anesthesia group. What about Phipps Hallowell. Wasn't he present?

Edward Lowenstein

Yes, if I didn't mention Phipps, I did wrong. Phipps was the first person to do cardiac anesthesia at MGH, and, I don't know, people don't know Phipps. Phillips Hallowell was a Boston Brahmin who, like many medical students, got tuberculosis while he was doing some kind of rotations or learning to become a physician.

And he went to the place in the Adirondacks for a couple of years. I'm trying to remember the name. It starts with S.

Glenn Gravlee

Saranac, wasn’t it, or something like that?

Edward Lowenstein

Right. Yep, Saranac is correct. He went there for a couple of years and, then came back and I think finished his medical training and probably went into anesthesiology at least partly because it was something which people considered that you could do on a part time basis and was not too physically demanding. He was a wonderful, wonderful guy. He was extraordinarily wealthy and had a place where he lived, I think in Dover. And every summer for one month he went to the Cape, where they had a house and during that month, he would allow a resident to live in Dover. So, for one month, one year, instead of living in a probably 300 square foot apartment across from the MGH, which cost, I think $110 a month, we moved into this gorgeous 25 acre estate and found out what, not the other half, but the how the other 1/1000th lived.

Glenn Gravlee

I have a vague recollection of something about Buzzards Bay. Does that sound like the right location?

Edward Lowenstein

Yes. I'm not sure. He was a sailor, and and they sailed in Buzzards Bay. I don't know if they had a place there.

Glenn Gravlee

And Dan Philbin came into the group when Kitz came in from Columbia? Was that about right?

Edward Lowenstein

That is correct. Dan came from Columbia.

Glenn Gravlee

So that was early ‘70s sometime. Go ahead, Mike.

Michael Fitzsimons

Did Dan eventually leave to become chairperson at the University of Massachusetts, or where did Dan end up going?

Edward Lowenstein

Sorry, I just don't recall. I know he left.

Glenn Gravlee

I think I think that's correct. I think Dan did leave to become the chairperson at Worcester (Ed: actually Vice Chair for Academic Affairs) probably in the ‘80s I'm thinking, because I left in ‘79 and Dan was still going strong at MGH at that point.

Edward Lowenstein

I wonder, is that when the UMass Worcester was founded and was he the first person to run anesthesia there?

Glenn Gravlee

I don't think so. Maybe Michael Stanton-Hicks preceded him there? I'm not certain, though.

And you mentioned John Hedley-White. I did not know he had been part of the MGH cardiac anesthesia picture. Can you tell us a little bit more about that, or him?

Edward Lowenstein

Yeah. Well, John was from Oxford, England. And he wanted to make sure you knew that. He he was a very bright, talented guy. His wife was a pathologist, and she eventually got a job at the MGH in pathology.

Glenn Gravlee

And he departed at some point to take the job that you ultimately had, right, at Beth Israel?

Edward Lowenstein

That's correct. I think he was the first academic anesthesiologist at Beth Israel, although I don't know that. I used to know that. Very, very smart guy, hard working, I'm trying to think of a good adjective. You didn't want to get in his way too much.

Glenn Gravlee

Well, I remember he had a conference over at the Beth Israel, the John Hedley-White Conference, that occasionally we were called upon to present cases before him, which was considered a highly intimidating exercise.

Edward Lowenstein

That's right. John was very good at that.

Glenn Gravlee

But you said he was an integral part of the initial MGH cardiac anesthesia group then. Is that what you're saying?

Edward Lowenstein

I believe so, yes.

Glenn Gravlee

Okay. All right.

Michael Fitzsimons

Ed do you remember much about the individuals that ran the bypass machines, the perfusionists, do you remember that team or do you remember the nurses that used to work in cardiac? Were they all specialized or could it be any nurse that was working in the operating room?

Edward Lowenstein

It was definitely not any nurse working in the operating room. And I don't remember the name, but initially it was a nurse and she was very good. They did what the surgeons told them to do. There really was no craft or specialty of running the cardiopulmonary bypass machine. Boy, I can't remember her name. Eventually, so the nurses in those days were all women. Eventually, there was a guy who ran it whose name I don't remember. Once again, I'm sorry.

In the beginning, the bypass machine was primed, I think, with eight units of whole blood. I'm not sure if that's true. Eventually, of course, it was a lot of hemodilution, and that made a huge difference because it was really a challenge to get that amount of blood. And I think that was in the beginning a limit to the amount of cardiac surgery that could be done.

Michael Fitzsimons

Yeah. Some of the historical documents said they used to have to, you know, do the procedures all late in the day because they had to spend the day actually collecting blood and whatever the blood bank was. And then if they didn't have enough blood, they couldn't do the procedure. But fortunately over the years, they were able to innovate and come up with systems to scavenge blood and better blood banking techniques, which really helped the development of cardiac surgery.

Edward Lowenstein

Well, hemodilution was just a revolutionary concept. I'm trying to remember, and I don't at this point, does anyone recall where hemodilution really started?

Glenn Gravlee

Oh, I used to know the answer to that, but, no, I'd have to do some research on it. My recollection is that Phipps Hallowell himself was pretty into that whole scene. That was one of his areas of interest and expertise. And he is the man who first got me sort of intrigued by the bypass machine per se, which became a big part of my career trajectory.

I'm trying to remember, you had specialized nurses helping the cardiac anesthesia team who had a background in ICU nursing as I recall. And then they became an integral part of our team, helping us set up, and I think unofficially helping you guys, the attendings, keep an eye on the residents. Do you have any comments on that concept?

Edward Lowenstein

Well, yes, that was very helpful for us. The cardiopulmonary bypass period could be very long, particularly if a guy named Bill Daggett was doing the operation – hours - and, I would go up to my office and work if I had a good fellow. And I probably shouldn't say this, and I don't think I did it very frequently, but in those days, I was a jogger, and occasionally - very occasionally - if I had a really good fellow that I had a lot of faith in, I would run upstairs, change my clothes, get into my jogging clothes and jog to Harvard Square and back during bypass.

Glenn Gravlee

That's awesome. Well, that's a good segue into a story that I remember. Cliff Emerson was a junior attending, and you, of course, were the head of the service in the late ‘70s when I was going from resident to fellow to one year as an attending there. And I remember a few times you and I and Cliff would take a jog - when none of us had clinical commitments was when we would do it - along the Charles River Esplanade, up in that general direction as well. I remember noticing that you drove a, I think it was a green beat-up Volkswagen Bug that was probably rather superannuated at the time, even in the late ‘70s.

And Cliff, of course, had an enterprise where he was running night call situations using fellows at various hospitals around the Boston area. And he, as an early junior attending, had a fully-loaded Buick Riviera. So I remember noticing that difference and thinking, well, if Cliff could own a Buick Riviera, probably Ed could own a Buick Riviera.

So I asked you, why do you drive a beat up Volkswagen as a Harvard professor? And do you remember what you said?

Edward Lowenstein

No, I don't.

Glenn Gravlee

You said, “Oh, that's easy. That's because doing things is better than having things.”

So I thought those were pretty inspirational words actually. And just off the cuff, maybe that was inspired by something you heard from your parents. I don't know.

Edward Lowenstein

Well, we were, refugees, Jewish refugees from Germany. Hitler came in. My father was the eldest of four sons of a German Jewish doctor. His name was Joseph Lowenstein.

And Hitler came in, and the first thing they did: My father was a wounded war veteran of the German army in the First World War. He had a right elbow fused at 90 degrees. His forearm was normal. His upper arm was wasted. And let's see, what was I going to say? He was a lawyer.

He was the oldest of the four sons. The second son stayed in Germany and said he was a loyal German, and he was sure he'd be fine. He died in Auschwitz. The third emigrated to South Africa and he and his wife lived out their lives in South Africa. And the fourth and youngest was Ernest Lowenstein, who came to this country. He took a year at the Mayo Clinic. He he graduated, I think, in 1936, spent one year at the Mayo Clinic, then one year at at Cincinnati General Hospital, of the University of Cincinnati. And he liked Cincinnati. There were a lot of Germans in Cincinnati, and intended to stay there.

And then he learned, to his dismay, that Ohio did not recognize German medical education or qualifications. And so he got in his car and went west, and he crossed the Indiana border, then he crossed the Illinois border, and he came to a street in which cherry trees were blooming. And the name of the street was Cherry Street.

The name of the town was Mount Carmel, Illinois. He said, well, I think I'll try this. And he did. And he became a family doctor, a general practitioner there. And he was my role model and inspiration to become a doctor. And without him, I never would have thought of becoming a doctor I think. After I learned to drive, I didn't have my own car, but whenever I could borrow my family's car for a weekend, I would go and hang out with Ernie and make house calls with him. And I decided to become a doctor. And so I worked hard in undergraduate school. I lived in our basement at home in a room I built and pretended I was going out of town to college. And I did well in an undergraduate school, probably better than I’d ever done before or after. The academic standards at the University of Cincinnati were not very high as I recall, which helped me a lot.

And then I applied to medical school after three years. I was in a hurry, and I didn't see the need to get a bachelor's degree. I applied to Western Reserve, the University of Michigan, and the University of Chicago, and I decided to go to the University of Michigan, largely because the tuition was $300, whereas the University of Chicago was $500.

And that was a big difference to me.

Glenn Gravlee

Sure. Let's switch gears just a little bit. In our first session, you talked about the myocardial depression, and the advantages of the high dose morphine technique in terms of not depressing the heart. But then you also mentioned that depressing the heart became more of a positive, desirable thing when coronary artery bypasses came on board.

And my recollection is that engendered some controversy in the ‘70s about which anesthetic technique was better for the patient with coronary artery disease, the hemodynamic stability of the high-dose narcotic technique versus allowing myocardial depression to become part of the technique by using, say, halothane or enflurane, and I think there were some debates in the literature and so on involving William Hamilton.

I just wonder if you had any recollections of those days.

Edward Lowenstein

Yes. I, I think I most definitely was on the wrong side of that controversy. Unquestionably. morphine was not, by itself, a good way to manage patients with coronary disease. They would become hypertensive, tachycardic, ischemic. It was hazardous. And so after coronary surgery came in, the use of morphine as an anesthetic, I think rather quickly disappeared.

Glenn Gravlee

Well, you also mentioned the previous time we talked about high-dose fentanyl or its congeners being more satisfactory, perhaps because of the increased depth of opioid-based anesthesia you could achieve, using those more potent opioids.

Edward Lowenstein

That's correct. And again, I don't recall how that all worked out, but fentanyl was really pretty magical. Boy, morphine we administered in the induction room, across from Room 8, which was caddy-corner from Room 10, which was the cardiac surgery room. And we would spend half an hour or an hour administering morphine slowly so the patient would have hemodynamic stability. And it took that long to administer it without causing hypotension. If you gave it too fast, it caused hypotension. On the other hand, with fentanyl you could anesthetize them in a minute or two.

Glenn Gravlee

Just blast it in. Yep.

Edward Lowenstein

And it's astounding.

Glenn Gravlee

Well, you know, I think it sort of came full circle is my recollection, because there was a debate from the purists on the inhalational side and then the purists, as you mentioned, you for a time at least being one of those, on the opioid side. And then I think we sort of figured out at some point, maybe it's best if we take the best of both worlds and use some of each. Do you remember that discussion?

Edward Lowenstein

I remember a debate I had with Joel Kaplan. Do you remember Joel? And I remember it was a debate in front of a lot of people, probably at the ASA or something. And I remember Joel said something to the effect that, morphine is a lousy anesthetic. And I didn't have very much to say to that. I think he was a much better debater than I was. And, I think, in terms of the eventual directions in which anesthesia arrived, he was probably pretty right. It was good for a time for a specific group of patients.

Michael Fitzsimons

Ed, how long did you keep these patients intubated after the procedure? And how long did they tend to remain in the hospital before they went home?

Edward Lowenstein

Well, this was we felt a major advantage of morphine, that you could keep the patients intubated without doing a tracheostomy. In those days, if people needed postoperative ventilation, which a fair number did, that was considered kind of a defeat. You did a tracheostomy and you kept them in the intensive care unit, first the recovery room and then the intensive care unit, for days. So leaving the endotracheal tube in place avoided that. And if people needed ventilation for six hours or one day, you could keep them that way and avoid the tracheostomy.

Glenn Gravlee

Well, I remember by the time we got to the to the mid ‘70s that that had evolved. I think that was partly driven by the presumed consequences of the red rubber tubes with the high-pressure cuffs. And then when the low-pressure, high-volume cuffs came in, I remember as a resident and fellow being asked to go to the SICU to change the tube out from the red rubber ones. Because once you reached that point

where you decided, okay, they're going to need to be intubated for a while, we need to get rid of the red rubber tube and put in a, I forget the name, Portex or something of that nature, high-volume/low-pressure cuffed tube. And one of our jobs as residents was to perform that exchange.

Edward Lowenstein

Right.

Glenn Gravlee

And probably what permitted the reduction in the need for tracheostomy was the advent of those, high volume, low pressure cuffs, don't you think?

Edward Lowenstein

I'm sure that had a lot to do with it, yes. And and that at least people felt that the vocal cords would not be permanently injured.

Glenn Gravlee

Well, or the trachea I mean, I remember Hermes Grillo was a pioneer in repairing these narrowed tracheas that resulted from those high pressure cuffs, supposedly.

Edward Lowenstein

Yep. That's right.

Glenn Gravlee

Mike, did you have anything else you wanted to ask about that? Otherwise, I'm pretty much finished.

Michael Fitzsimons

No, I think all this is fascinating. You know, if we come up with any other questions, we'll we'll get them to Ed. But no, I love the history. I think it's absolutely amazing. And, you know, I've written all these names down because I want to explore some of them and see what they did and see what happened to them afterwards. Ed, you had so much contact with people that were legendary in anesthesiology as a specialty and specifically cardiac anesthesia. It's just amazing. I mean, you came of age during during a really classical time.

Edward Lowenstein

Thank you. It's really remarkable to be in my 90s and recall this stuff, have it recorded, but not what I had expected. I can tell you that.

Michael Fitzsimons

No, it's great.

Edward Lowenstein

Thank you for your attention.

Glenn Gravlee

Well, thanks for taking the time to do this with us, Ed, we really appreciate it.