Sarah Alger: Welcome to Proto, a podcast that explores the frontier's medicine. I'm Sarah Alger.

Dr. Lee Schwamm: And Dr. Lee Schwamm. If you've needed routine medical care over the past several months, or perhaps had a medical emergency, you might've had your first run in with telemedicine chances are your providers offered some way to hold your visit over a laptop or mobile device.

Sarah Alger: The COVID-19 pandemic requires all of us to keep our distance. But distance care and medicine has been slow to catch on historically. Obstacles to payment, a lack of access to technology, and a conservative strain on medicine have all held telemedicine back.

Dr. Lee Schwamm: Now, that the horse is out of the gate with historic levels of providers finally embracing virtual care, what can we expect to happen next?

Sarah Alger: Telemedicine's moment coming up on this episode of the Proto Podcast brought to you by Massachusetts General Hospital.

In the early 1960s, Massachusetts General Hospital ran a satellite clinic at Boston's Logan Airport. For some of the 50,000 passengers who pass through the terminal each day an onsite doctor proved useful, even lifesaving. But working in the clinic meant that doctor had to commute twice a day through some of the city's worst traffic for the sake of a small number of emergencies.

One day, the head of the Logan Clinic, Dr. Kenneth Bird had a eureka moment. Why not set up two television cameras, one at the airport, and one at the main hospital's emergency room? Doctors could stay in the hospital, but hop on camera whenever a patient arrived at the airport clinic. It would also open the door to more specialists being able to peek in on tricky cases, and services could be delivered this way around the clock. This Logan Clinic was one of the very earliest examples of telemedicine. And it remains a good example of the shape it often takes today. Technology extends a physician's reach.

In recent years, however, the field has grown and innovated as devices evolve with each generation, and new ideas take root. I'm speaking today with one of the leaders in telehealth, Dr. Lee Schwamm. Dr. Schwamm is a neurologist with hundreds of published papers on stroke, which is the fifth leading cause of death in the United States. Some of his most impactful work is in telestroke care, delivering critical digital interventions in cases when every second counts. Dr. Schwamm, welcome.

Dr. Lee Schwamm: Delighted to be here, Sarah.

Sarah Alger: You recently had a research letter published in JAMA Neurology, you and your colleagues found that a quarter of hospitals now have access to telestroke care. Can you explain telestroke care and why telehealth has been so important for treating strokes in particular?

Dr. Lee Schwamm: If you look at examples of a disruptive approach or a disruptive technology that really an industry, you can look at Uber for transportation, you look at Airbnb for [hotel-ing 00:03:05] . What those companies did is they transformed a marketplace by creating a very efficient conduit between demand and supply. Unlocking trapped product, trapped supply in the hand available to consumers.

Telestroke, in many ways, did the same thing. Acute stroke experts, generally neurologists, are in very short supply, and they tend to be concentrated at academic hospitals like the Mass General, the Brigham, and others. But patients live all over the United States. They live in urban areas, they live in suburban areas, they live in rural areas. And when they have a stroke, they need to get to the hospital right away. And certain decisions need to be made within the first hour of arrival. Far too short a period of time to transfer that patient somewhere else for help.

And with stroke, in 1996, a medicine called Alteplase or commonly known as TPA was approved by the FDA to treat stroke as an emergency condition in the first few hours of symptoms that could dramatically improve outcomes and reverse disability. So, you needed access to a CAT scan, which most hospitals had, access to the drug, which was easy to purchase and store, and access to a stroke expert, which was very difficult to get particularly off hours. So, telestroke allowed smaller hospitals to buy a piece of an acute stroke neurologist whenever they needed it, rather than trying to employ one full-time. And not just one, but several because people can't be on call 24/7/365.

So when a patient comes into a hospital now, that doesn't have a stroke team onsite, they contact the telestroke team. They beam into the emergency department, review the CAT scan, examine the patient, talk to the family, talk to the bedside physician, make a recommendation. And after that, the patient might stay at that hospital, might be transferred for further care. That was the perfect storm for disrupting the previous model. And that's why it spread like wildfire across the United States and across Europe. I

Sarah Alger: I wonder if you can take us back to January 2020, which is a lifetime ago at this point, and explain what the landscape of virtual care was like back then?

Dr. Lee Schwamm: Well, before the pandemic, we had been working in this field for almost 20 years. Our first telestroke patient was back in January of 2001. But, even still, it was a network of 20 to 30 hospitals. It was a relatively small group of stroke neurologists. And we had just begun to expand into providing [tele-neurology 00:05:37]. So, non-urgent consultations in neurology to surrounding hospitals in New England. We'd been rolling out programs in other departments: in cardiology, in intensive care medicine and dermatology and others.

But the watershed moment really came when the pandemic changed the regulatory restrictions on providing this kind of remote care and also reimbursement. So, prior to that in January of 2020, to give you an idea less than 1% of all of our ambulatory care was being delivered virtually. And that went up to between 60 and 80% at our hospitals in the Mass General/Brigham system over a period of 6 to 8 weeks.

Sarah Alger: So, when it comes to the pandemic, I'd love to start with some of the innovations that were particular to it. Can you walk us through the Virtual Intercom?

Dr. Lee Schwamm: So, one of the greatest tragedies, in my opinion, of this terrible pandemic was the social isolation that accompanied it. And that meant not only were we having to keep ourselves separated out in the public, but when patients were admitted to the hospital, particularly early in the pandemic when we really didn't understand how contagious it was, and when we didn't have any rapid testing, patients were isolated in rooms. And staff only entered wearing several layers of personal protective equipment, including masks and goggles, and often face shields. And so, patients' experience in the hospital was one of no visitors, complete isolation, and the only providers they saw, basically they could see their eyes and that was about it.

So, what we quickly realized is a way to save on the use of personal protective equipment, and increase the humanity and the compassion of our care, ironically, was to do it digitally. So, we created a software system, modifying some software that we already had that we have been using in our telestroke program to configure an iPad to be able to be clamped to an IV pole next to the patient's bed, and automatically answer whenever a call came in. And that turns out to be technically quite tricky, actually.

And what that allowed the nurse to do, for example, of a normal 45 or 50 minute initial intake, they could spend 10 minutes in the room with the patient doing certain physical maneuvers, and then 40 minutes talking to the patient face-to-face uncovered, unmasked, [un-gowned 00:08:03] outside the room on either a handheld device, or a workstation and have a face-to-face interaction with the patient.

Patients found this extraordinarily meaningful. It helped our staff keep themselves safe. It reduced our infection rates within the hospital. And it also was a conduit by which we could bring in medical interpreters into those conversations, if necessary. So, it was a tremendously successful tool. And it took root in all of our hospitals almost immediately.

Sarah Alger: There's another innovation you wrote about in The Lancet called virtual rounds. How did those come about at MGH, and why were they important?

Dr. Lee Schwamm: So, we realized in those same first few weeks that literally I was on service working as the in-patient stroke neurologist, supervising a team of residents. And our teams are usually made up of anywhere from 6 to 12 people, depending on how many role groups are present.

On that first weekend in March that I was on, we had one positive patient and one doctor on the team with symptoms, which meant that eight people had to be quarantined until they had negative test results. And it became immediately obvious that Friday that we could not afford to let this continue, or we wouldn't have anyone available to take care of the patients.

So, in very short order, we reconfigured rounds so that the only people standing outside the room and going into the room, and potentially either being infected by a patient, or infecting each other were the attending physician and one resident. Everyone else was scattered around the floor in conference rooms, or perhaps they were at home because they had been quarantined because of a possible exposure, but were perfectly capable of working and participating in rounds.

So, everyone joined our electronic health record remotely, everyone joined Microsoft Teams Collaboration software invitation, and people could come in and out of rounds as necessary, not just the regular team members, but also guests, specialists, people who you wanted to get an opinion from who wouldn't usually be standing next to you, and just happened to be available when you were rounding. So it actually, I think, is one of the innovations that may have a lasting impact on how we rethink, and make our rounds experience, our medical experience more 21st century is this innovation to bring in additional elements of the team on demand, so they can serve multiple locations simultaneously.

The same concept I said before now, the expert, isn't the stroke neurologist, it's the pharmacist, or the social worker, or the chaplain, or the interpreter. It's whoever you need, being able to bring them in on demand.

Sarah Alger: Another program that didn't have providers as its focus was called Patient Connect. How did that work?

Dr. Lee Schwamm: Well, I mentioned to you before about this terrible social isolation. So, we solved on the one hand for how providers could connect to patients. But what about patients who either came to the hospital without their phone, or their iPad, or their Android tablet because they were critically ill and were rushed in, or who don't own one? How could their families connect with them, have long conversations, stay in touch? So, we modified our platform approach for the Virtual Intercom system to create a multi-lingual interface for secure video chat between family members and patients. Recognizing that family members who didn't speak English were at a specific disadvantage. So, we created some upfront web-based pages that would allow a patient to just go to the same page every time. All patients get driven to the same page, the Patient Connect page. And there, they're simply asked to enter the 10 digit security code for the Zoom video conference.

We provide them with that code, it's generated uniquely each time a visit is arranged. And then they can a dropdown menu on that page to select any one of 12 languages that they are fluent in and then follow the instructions in those languages, so they understand the experience. We also found this program was very widely embraced because the alternative was, and I heard stories about this every day, nurses taking their own personal phones, putting them in a Ziploc bag, and bringing them into the patient room because they felt so badly that their patients were so isolated.

Sarah Alger: And, of course, the other non COVID floors of the hospital need to connect to patients as well. What's been happening in virtual care for other conditions?

Dr. Lee Schwamm: Well, it's a really interesting example of how things spread and take on a life of their own. If you liberate the innovation, people find all sorts of ways to embrace it. One of the things we found is that a lot of patients, who are isolated for other reasons benefit from this technology is a lovely anecdote about a patient, a Arabic speaking patient, who was confined in a room on her birthday. And again, at a time when there were no visitors whether you had COVID or not, there were no visitors allowed in the hospital. And so, the team sang her happy birthday over one of these devices in Arabic, because she was all alone on her birthday.

In terms of other ways that we can use this technology, the concept of virtual rounds, the ability to create secure ways for patients to communicate with their families these transcend the COVID epidemic. And part of what we need is some time to just digest all these new innovations when we're not preparing for another surge, where we can do a real recalibration and say, "What did we learn from this? Where is this taking us? And how much of this care is going to be a permanent fixture in our future?"

And I can tell you from my own a system level organization, we're strongly considering how we can staff all of our community hospitals with specialists from our academic medical centers using one of these models of Virtual Rounds, or Patient Connect, or the Virtual Intercom system. And I think what we're seeing is convergence, where we're going to try to consolidate these programs into, what I call, an in-patient virtual care suite, where we're going to leverage this core technology of access to the bedside when needed. And leverage that for team-based care at the bedside, remote care from specialists, and engagement with families. And I think that's where we're headed is convergence of these technologies, rather than divergence.

Sarah Alger: In the middle of all this, you managed to help teach a continuing medical education course in June with the title COVID-19 As A Catalyst For Improvements In Healthcare Delivery. What big changes are we likely to see in telehealth as a result of the pandemic?

Dr. Lee Schwamm: Well, I have to tell you when I teach classes on this, the slide I usually start with is a Twitter post that says, "What was the biggest driver of innovation in your industry?" And the choices are A, CTO, B is CEO, and the third is COVID-19 and that's circled in big red pen.

There's no question that COVID has been an extraordinary catalyst. And it has shaken us out of our usual, as you said, conservative ways where we rather than very long and careful deliberation had to move quickly and nimbly. And we're not used to that in healthcare in part because we have a very important role in being stewards of safety. And so, we need to tread cautiously before we embarked on something to ensure that we're not causing unnecessary harm. And so, we have randomized trials, we use evidence-based medicine, but here we learned that sometimes rapid cycle innovation actually can bring a tremendous amount of clarity to what we're doing. And so, I would say the big changes I see are streamlined decision-making in academic medicine. As a result of this pandemic, we learned how quickly we can move and how productive we can be when we all align around a single purpose and surrender some local autonomy.

I think the other thing that we learned is that there are ways to automate many of the transactions that we now do by hand, and perhaps could do even more safely. We did a lot of automated triage of patients, and we automated the process of screening employees for having being healthy with no symptoms before they walk into the workplace. And there are lots of opportunities for that. There's a huge opportunity in big data when it comes to digital data. So, many of our patients are generating data now all the time with their smart phones, their wristwatches, their Fitbits, their smart mattresses. There's so much data that we could be bringing in.

Yeah, there are smart mattresses that tell you how much you slept on your left side, how much you slept on your right side. I believe that it's time for a digital biobank like we have genetics for a blood biobank, we need a digital biobank. And we need to be monitoring patients, and intervening before they have a deterioration. Not seeing them arbitrarily at three months or six month follow-ups, but seeing them when they're signals suggest that something is erratic, something is an outlier. So, I think that that's what COVID-19 has forced us to do is monitor people in and outside of the hospital intensively. So, I think you're going to see a big change there.

And the last is really the upscaling of the patient room. The room is becoming a place with a digital hub. And at $300 a piece for an iPad with incredible processing power and an open platform for development it turns out to be a very cost-effective way to think about upgrading the capabilities of any patient room.

Sarah Alger: One of the concerns you've raised is that care isn't equally available to everyone. Some people slip through the cracks, who are they and what can we do about it?

Dr. Lee Schwamm: When we closed our doors for business in the middle of the pandemic, because it wasn't safe for patients to come into offices and sit in crowded waiting rooms, we basically deprived everyone of access except for our emergency departments. And then, we did this miraculous thing where we restored access. It was like the yellow brick road. We suddenly created a way for everyone to get back on and be connected. And so, on the one hand, that's a huge victory. 100% of people were disenfranchised and we reconnected 85% of them. The problem is it wasn't random who we reconnected. We reconnected the people who were already connected, who were digitally savvy, who had smartphones, tablets, wifi at home, broadband that connected individuals.

And what we inadvertently did is likely increased the barriers to access for those who don't speak English, who have reduced access to finances and discretionary cash, and who have, what we call, social determinants of health. We're working very, very hard to address those, readdress those inequities it's part of our structural racism work is to make sure that everyone has access. And we've done a bunch of things to try to improve that. And we have a list of five or six other objectives such as in employing digital navigators, who are multi-lingual and who can help patients get on these platforms so that they can have these encounters.

It's thinking about wiring communities, and employing unemployed youth in low-income housing complexes and other places to be those digital navigators. So, building both youth empowerment and development, and investing in communities at the same time that we increase access to care.

It's thinking about translation. So, much of the medical record is in English. Even when the interaction with the interpreter is in the person's native language, the results of the tests are still in another language. So, that's another focus. How do we make ourselves an open space, so that people can equally share in the benefits of the wonderful medicine we have to offer?

Sarah Alger: So, I want to go back to something you mentioned a moment ago about machine learning and artificial intelligence with this digital biobank idea. Can you talk more about your hopes for what this data might yield for patients?

Dr. Lee Schwamm: I think it's one of the great opportunities that are within our grasp, if we can get ourselves organized, if we can get our industry partners engaged. And that is to collect an enormous amount of information about our patients and their environment, and use that to understand much of the variation that remains unexplained in medicine. If I have three people in my office, who've had a stroke, and I prescribe them the exact same medications they will have three different outcomes. And that depends to some extent on the area where their stroke is located on the MRI scan, and what their initial degree of disability is, and their risk factors. But most of it is unexplained variation, and it's quite likely that our social networks that we move among, our support systems, how we interact with our environment, what we do when we're not at the doctor's office has a huge impact on our outcomes. And the best chance we have of learning about that, and intervening to modify those outcomes is by huge amounts of passively collected data about how we interact with our environment.

We went from I don't know, a couple hundred, couple thousand visits prior to COVID per month or per year to 1.2 million virtual visits since COVID in my health system. That's a lot of visits. If you just think about the amount of data each one of those patients generated during that period of time, that creates an enormous collection of data co-registered with individuals for whom we have distinct clinical assessments and outcomes. That is a machine learning and artificial intelligence data scientist's dream because the data can speak for itself. And you can use neural networks and other techniques to ask the question of the data in an unbiased way, which of these profiles seems to be predictive of this outcome? And I think we're in a great position to capitalize on that capability, but it will take dedicated effort and really thoughtful creative people to make it happen.

Sarah Alger: It's been a privilege. Thank you so much, Dr. Schwamm.

Dr. Lee Schwamm: Well, Sarah, it's been my privilege and I think without the support, and the generosity of the people who work at Mass General Hospital, the doctors, the patients, the nurses, the philanthropists who support the hospital, we couldn't do any of this work. So, it's my great privilege to help us in our quest to serve the needs of our patients in this way.

Sarah Alger: And listeners, thank you for tuning in to the Proto podcast.

Dr. Lee Schwamm: Today's podcast was produced by Emily Silver, Bradley Klein and Jason Anthony.

Sarah Alger: Thanks also to our technical directors, Adam Keller and Chelsea Andes. Subscribe to the Proto Podcast on iTunes and Stitcher. And follow us on Facebook, Twitter, and Instagram. Stay safe and see you next time.