

CDC Ebola Response Oral History Project

The Reminiscences of

Henry M. Wu

David J. Sencer CDC Museum

Centers for Disease Control and Prevention

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Henry M. Wu

Interviewed by Samuel Robson
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Interview 1 of 1

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Q: This is Sam Robson with the David J. Sencer CDC [United States Centers for Disease Control and Prevention] Museum. It is September 13th, 2016, and I'm sitting here with Dr. Henry Wu at the CDC headquarters in Atlanta, Georgia. I'm speaking with Dr. Wu today as part of our CDC Ebola Response Oral History Project. Dr. Wu, thank you so much for being here with me today. If we could just start out, would you mind telling me your full name and your current position, like your current job?

Wu: Sure. And thank you for inviting me to come here.

Q: Of course.

Wu: Full name, Henry Ming-Yow Wu. My current position, I'm an assistant professor of medicine at the Emory University School of Medicine, and I direct the TravelWell Center, the travel clinic, based in the Emory Midtown hospital, in the Division of Infectious Diseases.

Q: Thank you for that. Can you very briefly describe your part in the Ebola response?

Wu: Well, as a travel clinic, one of the roles we play—in addition to preparing folks for travel—is dealing with potential infectious diseases that folks get while traveling, whether it's on vacation or for work. During the Ebola epidemic, it became clear that there was always a potential for somebody to return from Ebola-affected areas, or to visit there and return with, potentially, Ebola. Obviously, that would be our biggest concern, but also other infections which are common in West Africa. Basically, our clinic was heavily involved with our university and healthcare centers, planning to deal with returning travelers who might have Ebola but, probably much more likely, have other things that needed to be sorted out.

Q: Thank you for that synopsis. We're going to back up drastically now. Could you tell me when and where born?

Wu: I was born in 1971 in Taiwan, in Taipei.

Q: Did you grow up in Taiwan?

Wu: No. I moved when I was a baby. My father took the family to Seattle, Washington. He was doing his medical training there. And I basically have been in the United States since. Moved when I was in Kindergarten to Hawaii, where I spent most of my childhood through high school.

Q: What was it like growing up in Hawaii?

Wu: It was very nice, looking back, although when you're there as a kid and it's most of your world, you don't quite realize how good it is until you leave.

Q: That makes sense. What kind of medicine did your dad practice?

Wu: He's retired now. He's a physical medicine and rehabilitation physician.

Q: Was your mom also in the household?

Wu: Yeah. She mostly raised us. I have two sisters. She had various jobs over the years and ultimately helped my father run his clinic in Hawaii.

Q: What kinds of things caught your interest, when you were growing up, through high school?

Wu: I definitely was always interested in potentially becoming a physician, like my father. I think I was definitely a science student, interested in all kinds of science, and certainly about traveling and leaving Hawaii to explore not only the US but the world. It is quite a common phenomenon in Hawaii, where the bright students grow up there and they leave the state to study outside. And many don't return.

Q: I didn't realize there was kind of a brain drain going on.

Wu: Oh, yeah. That's always an issue. It's a challenge to keep folks staying in the state.

Q: In the most beautiful state. [laughs]

Wu: The problem is it's so expensive. Some folks want to come home but they can't, due to the job situation.

Q: Oh, I see. Lots of factors. So what happens after high school?

Wu: Went to college. I went to the University of Pennsylvania, in Philadelphia, which was a nice experience. I was really looking for a big city, something very different from where I grew up, in terms of a—well, Honolulu's a big city. But it is not a big urban center like Philadelphia or like the major East Coast cities. I was looking for that sort of change in pace. Studied biochemistry there, as well as minored in Chinese. Did some study abroad in China, so I got my start in traveling in college.

Q: And what after college?

Wu: Went to med school at Harvard Medical School, and again, I had a good training there, but also managed to get in rotations with the Indian Health Service. I also spent a month studying Spanish in Mexico, took some elective coursework in parasitology and in

social medicine. I really, during med school, got more interested in infectious diseases and public health, international public health.

Q: What would you say shaped that, kind of—that pivot?

Wu: Prior to med school, I had no idea there was a specialty of infectious diseases. Maybe I had a vague understanding of what it was. During med school, when I started working with infectious disease physicians on the wards, I really realized this was a great field for my interests. It is multidisciplinary. It is the intersection of medicine, of basic science, microbiology, parasitology, ecology. And it goes on and on. Things like even the weather affects infectious diseases. I think it's always an interesting field. I always liked reading the newspaper and *The New York Times*, just seeing what's going on in the world. And the fact that what I read there directly affects what I do in medicine makes it a very interesting field.

Q: What happens after med school?

Wu: I did my residency training in internal medicine at the University of Pennsylvania, came back to Philadelphia, and went through internal medicine with the aim of doing infectious diseases afterwards. After that, though, I actually took a small hiatus. I was a little burnt out from residency, and also maybe had some second thoughts. Did I rush into all this and never consider all my other interests? So I took a couple years off to do various things, the most offbeat of which was going to Harvard [Graduate School of]

Design for the summer to do a career discovery program. I had this side of me that wanted to consider architecture. Did that summer, and actually had a great time, but decided, going through that career was probably not for me, although I also got some great training there in design and planning. Then I did some work—some locum tenens work, and then, during this period, did my diploma in tropical medicine and hygiene in London, refocusing back on my main interests. Then did a couple jobs, including working for Indiana University as a volunteer faculty physician in their program in Kenya, in Eldoret. They have an academic program out there. I was out there for three months. Then went to Botswana, to work for University of Pennsylvania's program in Botswana, in Gaborone. That was an HIV [human immunodeficiency virus] treatment program. I was going to spend six months there, and did end up coming back a bit early because my boss sort of left the position. As somebody who was straight out of residency, I didn't have much to offer that program, there alone. So I came back and basically then started my infectious disease fellowship at the University of Pennsylvania.

Q: What year was that?

Wu: Two thousand two is when I started my fellowship.

Q: In 2002. Going back to Kenya, was Kenya—was that your first time in Africa?

Wu: It was actually my second. During residency, I did do a rotation that I arranged in Uganda—a little clinical rotation, for six weeks, in Kampala. But the Kenya experience

was really my first real, extensive sort of work overseas, a job. Helping to manage the program out there, teaching both Kenyan med students and trainees as well as American trainees who were rotating out. It still exists, to this day. It's an excellent program, and it had already been established for on the order of ten years, when I was there. It was an excellent model of an academic clinical and research program, that is very much a bilateral exchange between institutions.

Q: Then you mentioned, in Botswana, you were focusing HIV? Is that right?

Wu: Yeah. Back around that time, HIV was already being recognized as a staggering problem in Africa. Virtually nobody, in any large number, was getting treated. There was some controversy of whether or not even HIV treatment was even feasible in Africa, where—because the medicines were so expensive, and there were multiple pills and required, at least by Western standards, extensive monitoring that was not necessarily easy to do in Africa. Botswana actually was on the forefront, in that the government very much wanted to start a treatment program. What they did was they partnered with various organizations, including—through Merck, which funded a lot of the initial program. Through that, University of Pennsylvania was recruited to help administer—basically be clinical consultants for that national program and open their first clinic. I went out there basically to be more—to work in that clinic, basically. But pretty soon after I got there, my immediate University of Pennsylvania supervisor, for personal reasons, had to leave the job. It basically was clear that new leadership was needed, and there wasn't much for me to do, at that point. So that ended fairly quickly, but actually was a good—it was a

good experience, in that working—seeing up front how to work with administrative health, as well as with a big pharmaceutical donor, and with management consultants, and really in a major project like that, fairly high-profile one—was a good experience. Sometimes I think I made the right decision. The best decision is to back out when it's not necessarily going well.

Q: Yeah! No, absolutely. Good advice. Where did you do your infectious disease fellowship, again? I for—

Wu: University of Pennsylvania.

Q: That was also University of Pennsylvania. Okay. Gotcha. What happens after that?

Wu: I basically got a job. I considered a couple things, but I ended up taking a clinical academic job at Drexel University, and at Hahnemann University Hospital. And basically decided it was—I finished my training, but I really wanted clinical experience. I spent two and a half years there, doing general infectious diseases, inpatient, outpatient, as well as HIV work. Learned a great deal. It was also a bit of a burnout job, as any junior clinical attending job can be.

I was also beginning to think that I wanted to do more—get back into the public health type of work. I initially thought I would do a part-time MPH [master of public health degree] at the Drexel University School of Public Health, and attempted that. That pretty

much didn't get far because I was doing a full clinical load, and decided writing papers in the middle of the night—I couldn't physically do that. At that point, I decided to make a jump to public health and apply for the EIS [Epidemic Intelligence Service] program. I had some mentors in the past, a research mentor and then—in my fellowship, Kelly [J.] Henning, who moved on to the New York City Department of Health, and other folks at Drexel Hahnemann who were EIS alumni from the early days, Elias Abrutyn and Matt [Matthew E.] Levinson. I'd seen how EIS was critical to their careers and how fondly they had spoken of their experiences. I knew this would be a great—potentially a great way for me to get into the field and make the change. So I applied and got in and came down to Atlanta.

Q: How did they talk about their experiences? What was your impression of what EIS meant?

Wu: On one hand, they spoke about it fondly, and it gave me these visions of it. But I'll admit I still didn't really have a good feel for what they were actually doing. All I knew was that they traveled and were—Dr. Abrutyn talked about, if I recall, working on cholera in Bangladesh and literally holding up his own IV [intravenous fluid] bag while he was on a boat, [laughs] getting transported out of somewhere. It was a little bit of a romantic vision. But at the same time, it rang true to what interested me in infectious diseases and public health. As much as I enjoyed clinical infectious diseases in the US, most of what we deal with in a hospital is—a lot of it is hospital-related infections and very challenging things. But I think what always drove me was the infections that are

more out in the world and have determinants that are multifaceted. I thought it was an excellent career move, at that point.

Q: How does EIS proceed?

Wu: It was a great experience. I matched with the Meningitis and Vaccine-Preventable Diseases Branch in NCRID [National Center for Immunization and Respiratory Diseases] and had a great experience, primarily doing meningococcal meningitis work but also some work in pertussis and some of the other infections that we dealt with in that branch. It was a great branch in that I was involved in international and domestic work, surveillance, outbreak investigations, as well as some more straight research work on analyzing the performance of diagnostic tests. I had my own exciting travel experiences, and I tell folks, ironically, I'd been deployed to meningitis outbreaks in Africa, and I went to South America and got mugged in Brazil, but by far my most dangerous assignment was being sent into Fargo, North Dakota, during a blizzard, when it was twenty below, to deal with a resistant meningitis outbreak. That is not an exaggeration. I think it really was the most physically dangerous assignment, given that I'd grown up in Hawaii. And how to even drive a car and then be safe when it's that cold outside is not something you learn from growing up in Hawaii.

Q: No, no doubt. I grew up in Iowa, and I probably wouldn't do well in that environment.

[laughs] Wow! Where else did you—you said you were in Brazil, you went to—

Wu: Yeah. Brazil was a research collaboration with FIOCRUZ [Oswaldo Cruz Foundation] in Salvador. We were looking into diagnostic test evaluation. I was involved with the branch's work in epidemic meningococcal disease in the meningitis belt in Africa, went to Burkina Faso a couple times to assess their surveillance system. This was in anticipation of the rollout of a serogroup A conjugate vaccination, which would potentially address the massive epidemics that historically affected the meningitis belt. That's a large, international collaboration, WHO [World Health Organization], [Bill & Melinda] Gates [Foundation], MSF [Médecins Sans Frontières]—you can go on and on—Serum Institute of India. I'm quite proud to have played a tiny role in that rollout, which has since been quite spectacular. But early on, I was out there to help assess the surveillance system in Burkina Faso. This is one of the things about public health I had no idea about before I came to EIS. To even control diseases, you have to be able to count them accurately. To even know if your interventions are working, obviously, you have to be able to count it. First step is often just figuring out how well can we count—how well can the system that's in place count the diseases and the cases. That's what I did early on.

Q: Who did you meet in EIS, who—I don't know—who you look back on as standing out in your memory?

Wu: Our branch chief, Nancy [E.] Messonnier, she was a large reason why I decided to try to match on that team. I had actually known her name from the past because she had actually trained in internal medicine at my program at the University of Pennsylvania.

This was some years before I was there. But I had heard her name, over the years, as another person that had done EIS. I had some mentors at Penn who had said, “Oh yeah, Nancy”—I think her maiden name was Rosenstein—“Nancy Rosenstein, she passed through our program. She went to CDC, and now she’s the world expert on meningococcal disease.” I even heard about her when I was a resident. I knew she had really done excellent work. I’d realize that that sort of career sounded exciting to me. I certainly did enjoy working under her. It was a great experience. She certainly was a great mentor and leader. She certainly gave me the opportunities to really learn and to grow as a medical epidemiologist.

Q: What happens after EIS?

Wu: I stuck around for a couple years in the same team as a medical epidemiologist, basically continuing the work I did as an EIS officer, and at some point decided it was time for a change. This was not too much of a big shift, in that I would—I’d always thought, as much as I enjoyed the meningitis work, I don’t think I was going to spend my whole career just studying primarily one pathogen. I think too much of my interests were in a whole lot of different things. I thought it would be a good time to change. Also, as is quite common at CDC, switching positions is almost per routine, if not even encouraged when I was a US Public Health Service officer. It was even encouraged for promotion to show that you can do different things. I thought it was a good time to start looking around. I interviewed in various other positions at CDC, including with DHAP, Division of HIV/AIDS Prevention.

Around this time, I got a random phone call from David [S.] Stephens at Emory University, whom I knew because he is a meningococcal disease researcher. He and his lab [laboratory] have long collaborated with our branch. I'd already worked with him on some things. He had just called me, out of the blue, to ask me if I was interested in a position at Emory University, primarily working in the travel clinic that was based in Emory Midtown, run by Phyllis [E.] Kozarsky. Right away, I was very interested. Because on one hand, when I had left Drexel University, I had already decided, I don't think I can go back to the same sort of job, where it was primarily general, inpatient infectious diseases. As much as I liked it, it wasn't where my passion was, and it was very much a tough job. I certainly didn't want to go back to that. But what was presented here was really a focus on travel medicine and tropical diseases, a job that would encompass a lot of my interests. I also recognized it was a very unique opportunity. Phyllis Kozarsky was one of the early pioneers of travel medicine and founded this clinic back in the late eighties. I'd already known about it, even though I did not know her personally, at that point. My understanding was that this is one of the very few full-time academic travel clinics in the country. Most travel clinics out there are private clinics. They don't necessarily even see sick visits. They just give shots. This was really more of a comprehensive travel, tropical disease clinic, in an academic setting, which is very unusual in the US. It's more common overseas, in Europe, say, or in Asia, where they have full hospitals for tropical diseases. We don't have that in the US because our healthcare is much more homogenous, where each hospital can potentially take care of

anything, as opposed to specialized hospitals. It was a good opportunity, and I very much jumped on it and came over in 2011 to work with Emory.

Q: Sorry—clearly, I don't know very much about this. But if it's doing much more than just giving shots, which is like so many other travel clinics in the US, what is it that they're doing?

Wu: On the pre-travel side, giving shots is a lot of it, but it's basically preparing travelers to go to places that are usually tropical—or not necessarily technically tropical, but developing countries or places where extra preparation is needed. That would basically encompass anywhere outside of Western Europe, Canada, Japan, Australia, New Zealand. Just about everywhere else, you do have to take a little more precautions than we would normally do visiting more developed areas. Shots is a large part, certainly a lot of travel-related vaccines that are needed, as well as making sure everyone's up-to-date with their routine vaccinations. Malaria prophylaxis is a huge part. If you're going to an area with malaria, then certainly taking—there is no vaccine—taking prophylactic medications is going to be important. Finally, many other, nonprescription interventions, things like advice on bug avoidance, so mosquito repellants and things like that, to help prevent malaria and dengue and chikungunya—you can go on and on with all the infections that are passed by biting insects. Also, things like altitude illness, safety issues. I think a lot of Americans who have not traveled much don't quite realize that in most of the world, you have to be extra careful because we don't have all the safety regulations and things that protect us every day, whether you know it or not, in the US.

I do find those consults both interesting and challenging. We see a lot of folks in our clinic who are going on complicated itineraries, have complicated medical histories, folks with transplanted organs going to very potentially risky areas. It's also challenging because every patient is different and because much of pre-travel interventions, including the consult and the shots and the malaria pills, they're typically not covered by health insurance. So unless your employer is covering it for a work trip, often it comes out-of-pocket. That makes it challenging because not everyone has those resources. I spend a lot of my consults, often, just helping travelers decide where their money is best spent. It may be the case that they can't get everything that I would like to give them. That's the unfortunate reality of our healthcare system. We have to pick and choose, what I help—I help them decide which is going to be the most important for their trip. That's a challenging part of the work.

I found it [working in a travel clinic], after working at CDC, to be—what I tell folks, it's public health on the individual level. When you're at CDC, when we were doing vaccines recommendations for meningitis vaccination, we're looking at the country as a whole. We're making assessments on, is it effective, is it safe, is it cost-effective. And if it is, then we take it to the ACIP [Advisory Committee on Immunization Practices] and there's a vote to make this a shot routine for adolescents. On an individual level, most of these vaccines, they're approved and—but there are very—the recommendations from ACIP and CDC are a little more open-ended. “Consider this vaccination.” “Consider,” you know, “Japanese encephalitis vaccination.” What it means is, it may not make sense for

everybody. Not everyone's going to have a high risk of disease. On top of that, not everyone can afford it either. It leaves a big, open end. I feel like, to this day, when I see a pre-travel patient, I am trying my best to maximize their health, given their resources available immediately in front of them, and help them make decisions during travel. It's actually quite challenging, even though a lot of it, you could argue, is sort of dictated by CDC, which gives a lot of good recommendation on what vaccines are recommended for most of the world and where you need to take malaria pills. But in practice, bringing that to individual travelers has a lot more complexities and is a challenging part of my job.

The other side of our work is the sick visits. Hopefully, folks go and stay healthy. That is our goal. But when they do come back, whether or not we saw them before travel, we are here to help assess potentially what they may have. A lot of it is mundane or what you would expect—traveler's diarrhea, the flu [influenza], coughs and colds, nothing serious, nothing different than what you might even get from a domestic trip. But even when it is simple, we have to be mindful of the other things that they could have gotten. That's the challenge. In other clinics, where it would be much easier to say, "What it sounds like is you have the flu. You need to go home, take some rest, take some Tylenol. Call me back if it doesn't get better." In our clinic, if somebody may have the flu but they'd also come back from India, I need to consider other things that can cause a high fever, like malaria or typhoid or maybe even something even worse, like avian influenza or SARS [severe acute respiratory syndrome]. These things have poked their heads up in various parts of the world, over the years. This is the challenging part of that job. Even so, even when it is something mundane, it does make it a little more complicated. On top of that, we do see

the more exotic things, the cases of malaria, dengue, leptospirosis. These are fairly regular, if not everyday. Certainly, it makes my job very interesting.

Q: Previous to Ebola, were there any epidemics or anything where you saw a large volume of patients coming in, and screening them for that, and focusing on one specific thing?

Wu: In my time at the TravelWell Center, no. Ebola was the first one. I can imagine previous large international outbreaks, like SARS, in the early 2000s—that was during my fellowship—had a similar effect, where something new comes on the field and you had to be very careful about it. But no, prior—when Ebola became a major international issue, prior to that, our practice was pretty much as I described: seeing a lot of the common stuff, looking out for the dangerous stuff that pops up once in a while. But nothing that is off-the-charts dangerous. I will say, though, before Ebola, I was always a little nervous because of the recommendations about potential cases of avian influenza or something called MERS, Middle Eastern respiratory syndrome. These all popped up prior to Ebola. They did not necessarily quite have large outbreaks in the US. But I was aware that they were out there and that potentially travelers could have them. And I always recognized that, if I had somebody in-clinic with this, we could have a big problem, knowing that the recommendation from CDC was to take some extensive protective-equipment precautions, like N95 respirators, goggles, things that were not routine. I was already a little nervous, and the fact that I may see somebody coming back from one of these countries who might have one of these things, how would I handle that? Because

we don't have negative-pressure rooms in our clinic. So technically, if I really suspected that, I shouldn't even be seeing them in our clinic. And if I brought them back to clinic, I potentially have exposed our waiting room, our nurses and folks. I was already struggling with that. Maybe once or twice before Ebola, I had a case, I got really nervous about it. There was no easy solution. Just getting a call about a businessman who just came back from the Middle East and had what sounded like mild cold or flu symptoms, to potentially send him to the ER [emergency room] just because I was worried about an infection that had not been described yet as coming to the US, was no small deal. What do you do, in that situation? There was no good answer. In fact, we would see him in-clinic, throw a mask on him quickly, and try our best to convince ourselves that we didn't have to worry about MERS or avian flu. But that was kind of the—so by the time the Ebola issue came up, I'd already been thinking about gosh, what do you do with these folks, who may have something that takes much more levels of protection and caution than everything else that we'd ever dealt with?

Q: How do things proceed as the Ebola epidemic gets out of hand?

Wu: Emory, of course, became prominent when we received the first cases transported back to the US, the Americans with Ebola infection. That's the team led by Bruce [S.] Ribner, my colleagues in the Division of Infectious Diseases. I was not on that team. I certainly wasn't involved in the care of those patients. But certainly, that—I believe that was back in August of 2014—that certainly brought all the attention to Ebola. Emory was kind of front and center. On top of that, with CDC in town, this was sort of the major

focus for Ebola work in the United States. Early on, as our colleagues were taking care of those patients, discussions started both in our clinic and in the health system as a whole, began on, what would we do if somebody came in with potential Ebola. Would we be prepared? Early on, we started writing up procedures, SOPs [standard operating procedures], to see these patients. We followed the guidelines that were offered by CDC on the recommended protective equipment. This was early in the game. We're talking August, September, when things were still being figured out. But by—somewhere around that period, August, September, we had already seen our first rule-outs on folks who might have Ebola. They fit in some potential criteria, such as fever and recent travel to West Africa. We put a procedure in place to basically get them—bypass the waiting rooms by intercepting them or having them meet us at an old ambulance entrance. We would develop a way to bring them back to our clinic through a freight elevator. In short, it was kind of awkward, and we were, honestly, making it up on the fly, but trying our best to apply the recommendations from CDC.

But it was very obvious that this was important. It was becoming clear that the infection was potentially extremely contagious in the healthcare setting, based on what was being described in Africa. And the fact that, early on, the symptoms were very nonspecific—fever, headache. The severe complications and the severe illness was, generally speaking, a later complication. In the beginning, folks can look like somebody that just has the flu or malaria or things that are more common—but, obviously, indistinguishable up front. CDC had basically started putting up criteria for what they call the PUI, or the person under investigation for Ebola. That would be what they'd done for other serious

infections in the past, like MERS—giving criteria for travel within the certain period to these countries that have Ebola, as well as a list of symptoms. If they had both, then they need to be considered a person under investigation, basically somebody who might have the disease. Now, one thing in public health is you want to make a definition like that very broad and nonspecific. The idea is you don't want to miss that one case. The way you pay for that is you have a lot of false positives, meaning that a lot of folks get flagged as might having Ebola and they really don't have it. But that's the price you pay to be very careful.

So we started this, and everything shifted and took a major change in October, when the case in Dallas, of the patient who was not initially detected and returned to the ER with full-blown Ebola illness—and then subsequently two nurses getting sick while taking care of him. That changed everything in many ways. I think, first of all, it hammered in that this was a real risk, that an undetected case coming into the health system can be a real danger to everybody—the patient, the doctors, the nurses, other patients. Secondly, it did underscore the fact that the current personal protective equipment recommendations from the CDC were not quite adequate, both in the—kind of the amount, as well as the—you know, there was not much emphasis on the donning and doffing procedures of PPE [personal protective equipment].

Dr. Ribner's team, in our Ebola treatment unit, they had developed their own PPE guidelines and procedure for donning and doffing that was very conservative, early on, to their credit, on their own. So basically, by the time October came around, we had made

that more of a system-wide policy for PPE, in these potential Ebola cases. Very strict donning and doffing procedures. Even though we were not using the PAPRs [powered, air-purifying respirators] or the breathing apparatus to see these rule-outs, we were using a level of PPE that was certainly not routine, certainly above what had initially been recommended for CDC. That included hair bonnets, face shields, mask, shoe coverings, double gloves—and again, a very strict attention to donning and doffing procedures, even for these low-risk PUIs, which is what we were seeing.

One more thing. While this had been going into full speed, and in October, we started to see fairly regular cases, whether it's just-returned travelers—and as folks probably know, there's a lot of West African communities and immigrant populations in the Atlanta area. On top of Ebola, response workers—by now, this is full swing. There's plenty of aid organizations and public health organizations like CDC, WHO, MSF, that are all responding. A lot of these folks, potentially, they're passed through Atlanta or live in Atlanta or are coming through. Again, after going to those places, if they were going to get any kind of illness that might have symptoms that were consistent with Ebola, they may meet criteria. So ruling out folks started to become more regular.

At this time, though, I was beginning to really dread later in the winter because the flu season, which would typically hit at some point, somewhere in November through January—I realized, if there was a bad flu season, we could potentially see a lot of cases of return travelers who really have the flu, but obviously, we had to take precautions with. That's precisely what happened, around December, when we had a bad

convergence of many things. First of all, a bad match between the flu vaccine that season and the circulating strain, which meant a lot of folks who had the flu shot still got the flu. It was not a good year for the flu shot. Secondly, the peak of the flu season seemed to hit sometimes in December, and that was a popular time, of course, for folks to be coming home to Atlanta after potentially working abroad. Again, the most common symptom of flu, probably high fevers, was one of your clinical criteria for a person under investigation. So even before the flu season hit, I had this bad feeling that we would have a busy winter. And it certainly was the case. Our rule-outs increased significantly. There was probably one week where we did three in our clinic, as well as another day where I remember we did two rule-outs, two patients side-by-side, on two separate rooms, with two physicians.

A little bit more about the procedure. The majority of the cases, we tried to see in our clinic when possible. The idea was that most of these rule-outs probably were not severely ill, probably were not bleeding or throwing up or having diarrhea or anything that would make it really messy. They probably would mostly have the flu or other sort of minor ailments. The idea was to spare the emergency departments from having to be overwhelmed by them. Now, the emergency departments developed their own protocols. But they were still quite extensive, in that parts of the emergency department would have to be sectioned off. A nurse and potentially a physician would be assigned to that room and potentially be stuck in the room until the patient was determined to be cleared of Ebola. It was a pretty big burden for the emergency departments at Emory, to see one of

these rule-outs. The idea was to try to, when possible, get them into their outpatient clinic, with special precautions.

What we would do is we would triage any call we got about potential cases. First of all, anyone who sounded like they might have Ebola and—let's say if somebody said they were stuck with a needle while working in an Ebola treatment unit in Africa, now they have a fever. That's a case we would have—I would have picked up the phone, called Dr. Ribner or one of his colleagues and said, "Hey, we got a potential case here. This is time to open that [Serious Communicable Disease] Unit up." Or anybody who had a really, really good story of probably—or high chance of having Ebola, we really didn't want to risk bringing them into clinic. Second issue, anybody with wet symptoms—that would be the bleeding, nausea, vomiting, diarrhea. Even if the more likely cause was a bad case of food poisoning, because of the extra precautions with these PUIs, anybody who even just threw up or—in our clinic, or let's say, threw up on the way to clinic and got it on the hallway—that would have been a big, difficult situation for cleanup. Anybody with wet symptoms, we would triage to our emergency departments, because they were better equipped to deal with those sort of symptoms.

What that left us with was folks with relatively low suspicion of illness. By the CDC's PUI criteria, these would be the lowest tier—low but not zero risk of Ebola. Basically, they have some mild symptoms of illness and they had traveled, in the preceding twenty-one days, to the Ebola-affected areas, and on top of that, they did not have wet symptoms. If they sounded stable on the phone, we brought them into our clinic, if we could

accommodate them. We weren't open on nights or weekends, obviously. Certainly, if somebody needed to be seen at those times, we would send them to the ER. But the hope was to get as many as possible to the outpatient clinic. We ended up seeing quite a few. I think it's—depending on how—even into 2016, we've seen some—we saw an odd potential rule-out for Ebola, again, very low-risk, low suspicion. But the total number, I don't have an exact count, because it's kind of a vague number. But across the whole university system, maybe on the order of forty or so forty-plus persons under investigation of Ebola. A large percentage of those, on the order of half, when we published a case series, were seen in our clinic, as outpatients. So we were happy to spare the Emergency Department some of the burden of seeing all those.

On the other hand, it was a real challenge for us. Seeing one of these cases, again, involved a huge crew, meeting the patient in the ambulance entrance, bringing up through the elevators, and bringing them to our clinic. We took extra precautions with PPE, with cleanup, everything, getting the blood drawn. We'd draw them inside our clinic. We did not send them to the outpatient lab.

And we often would hang onto them. If I was worried about malaria, I would keep them in clinic until I got the malaria rapid test back. Because if it were positive, we would admit them. Occasionally, my suspicion was so low of anything serious, I would see them and—I should mention my colleague, Dr. Jessica Fairley, in our clinic, also saw a lot of these patients. We were the two physicians in TravelWell doing this. We would send them home, basically, if we had our low suspicion, and often even before initial lab

tests were back, and again, send them home with some precaution, escorting them out—tell them to go home, self-isolate. This was all done with full coordination with health department officials, so that they were aware of what we were doing, of what our thoughts were clinically. They would pick up the monitoring and surveillance—or watching them, keeping track of them after they left. We would also keep in touch with them, would call them back the next day, kind of let them know the results.

The whole goal was—again, for these folks to be seen in our clinic, we knew that they probably didn't have Ebola. But again, they made this criteria. The goal was to hopefully diagnose an alternative. We were very aggressive in testing, looking for flu, malaria, things like that—as well as potentially treating that alternative, so giving them Tamiflu, oseltamivir. The idea was, the sooner we could identify an alternative and also treat it—we could make these symptoms go away. Now, identifying an alternative did not necessarily rule out Ebola, because you can have two things at once. There were certainly cases described in Africa of malaria and Ebola coinfection. Certainly, we couldn't rest on that. But it certainly made us much more comfortable and the patients more comfortable, when we could tell them, “You have the flu. It's probably just going to get better in the next day,” or “The Tamiflu will make it go better pretty soon.” That was the case, in the vast majority of the time. Flu was the most common diagnosis. We were very aggressive in treating with antivirals like Tamiflu. We were very aggressive in testing. If you had a fever, we would check, you know, malaria smears and blood cultures, again. And doing a level of treatment and diagnosis. You know, anyone with flulike symptoms got a nasal swab, looking for flu and other respiratory pathogens—being much more aggressive than

I would have done in any other setting. Usually, if you go by the recommendations, an otherwise young, healthy person with a mild case of the flu does not need antivirals. But this was a very unique situation, you know. Any extra day of fever caused a lot of worry for the patient, their family, the health departments. The sooner we could identify the cause, treat it, make the symptoms go away, the much easier things would be for everybody. So it was a very different kind of medicine than I'd ever done before, this sort of really aggressive—identify and treat something to effectively rule out Ebola.

Actually, I should also mention, Ebola testing, we certainly had it available. Our lab in the Ebola treatment unit was doing it. And we also had our colleagues in CDC, down the street, that were potentially able to test. However, the key limitation of Ebola testing was that it was widely reported that, in the first three days of illness, the PCR [polymerase chain reaction] tests could be negative. Those tests were great if they were positive. You kind of knew what you were dealing with. But if they were negative, they did not rule out Ebola. We actually tested very few folks that we had ruled out. Because most of them presented typically within twenty-four hours of their first symptom. They were being monitored every day for fevers. And when the health department heard that they would have a fever, you know, they would be triaged or told to get evaluated and often directed to our clinic. So, both because my suspicion was very low for Ebola but also because they were early in their symptom onset, there was no point in testing them. And then testing them, obviously, had other limitations. It was, obviously, expensive. We would have to get the specimen over to the treatment unit. They would have to fire up their lab and call in on-call lab staff. It was no small deal. And the turnaround easily could be six to twelve

hours to get that whole process done. There was no way we were going to have somebody wait in-clinic for twelve hours to do that. On a practical level, it was not deemed practical or necessary medically to test for Ebola, in the vast majority of the rule-outs we did.

So that was the challenge, ruling out Ebola without a good test to really rule it out.

Basically, we had to find that alternative cause and make sure the patients got better.

When they got better, then we could say, look, this isn't Ebola. Ebola doesn't get better like this.

Q: Right. [laughs]

Wu: That was a very interesting time. And quite fortunate that, otherwise, our clinic was not too busy. I think one other effect of the Ebola epidemic is a lot of travel dropped dramatically, particularly to Africa. Prior to Ebola, we saw a lot of folks going on business or safari vacations to Kenya, South Africa, and even also, a lot of business travel to West Africa, Nigeria, Ghana. That pretty much dramatically dropped, especially to West Africa, but also to Kenya. There were a lot of misunderstandings out there, assumptions that just because Ebola was in West Africa, potentially all of Africa was dangerous to travel to. So really, a lot of pre-travel business dropped very dramatically. It was fortunate in the sense that it gave our clinic a lot more time to deal with these rule-outs. Because one rule-out in our clinic really tied up a doctor, [an RN], an LPN—a [licensed practical] nurse—and one of our clinic administrators. Usually, it tied us up for

three hours or more to deal with this, with one patient. It was a very unique sort of situation.

Q: At the height of it, what would you say the rate of patients were, like the number of patients you saw a week?

Wu: At the highest point, it was three that we saw, in our clinic alone. There could have been odd ones that also popped into ERs. But for our clinic, this was right in December, right around the holidays. Three. And there was a good period from late November through February, almost into March, I feel like we were seeing, on average, one a week. It became very routine. Our staff became very used to it. I really should say, our staff, our travel nurses, our LPNs, our administrators, they really stepped up to not only learn this procedure, do it, and also do it—really valiantly being careful and yet being not too concerned, in that we were all assured that we were taking the proper precautions and that these were low-risk patients to start with. Never at any point was I ever worried that we had a serious situation, a potential spread in-clinic.

Early on, when we were figuring it out, there were times where we had to adjust our procedures because we didn't—again, we were just figuring this out on the fly. There was, let's say, an example where we did see a returning worker who was working on the Ebola response, who came back to town. This was early on, maybe around September or early October. On the phone, they sounded like they don't even have the symptoms of Ebola—no fever, no nausea, no vomiting, no diarrhea, just some runny nose. And they

needed a place to go. The other phenomena that was going on in time is, it didn't matter what your symptom was. You could have a pimple, and yet, if you went to your doctor's office and told him, "By the way, I just came back from Liberia," they would basically say, "Don't come," or "Please leave," or "Go to the ER." Basically, all these folks didn't even have a place to go for really minor, non-Ebola symptoms. So this patient, early on, called us and said, "[I] have some mild symptoms." And I said, "Sure, we can see you." The patient came a few hours later.

I told my staff, "Don't worry. They traveled but they have no symptoms. So there's no special precautions." And, of course, I sent our LPN in, as per routine. She took them in and took vital signs. She came back with the vital signs and the patient had a fever. I could tell she was very nervous, and I got very nervous too. Because we realized this one just slipped in and caught us off-guard. Now this patient, technically, we need to do precautions on. While I could put on the protective equipment, I just had a nurse who'd gone there with very limited protective equipment, maybe a pair of gloves, maybe a mask, but otherwise nothing else, in a patient who meets criteria for possible Ebola. The good news is, there was always a good story for flu. And that's what the patient had. But this really was a lesson in that we really had to be careful about anyone who had traveled coming into our clinic. Even if I was confident they didn't have the symptoms, I would tell them, "You need to check your temperatures, even up to the moment you leave home, and let us know if you have a fever." Anyone who I thought might potentially pop a fever, sounds like the flu maybe, even if they don't have a fever yet, we would take the

precautions just because we didn't want to get burned. If they have their first fever in-clinic, that counts. The lesson was we had to be careful in advance.¹

We also had some other lessons too—transportation. A lot of these patients were well, and they could self-transport, drive themselves. They had the flu or something fairly minor. But some folks from the community actually didn't have a way of getting in. How do you—you can't exactly tell them to catch the bus or an Uber or something, when we're thinking they might have Ebola. So we worked with our EMS [emergency medical] services and our county health departments. There were times where an ambulance had to be scrambled to take somebody home. We had patients a couple times—and there were some really tough questions. Who pays for this? We had a patient who came in essentially for a sick visit with the flu, to an outpatient clinic. Insurance is only going to pay so much. Who pays for the ambulance transport? Who pays for the protective equipment? All these questions came up. Answers had to be figured out. Sometimes our hospital absorbed some of the cost, sometimes the health departments covered it. Organizations that had employees returning from response, obviously, often stepped up to cover the costs. But there was no answer to this, before this happened. We'd never dealt with this before. Our healthcare system was not prepared to deal with this, at any level.

¹ Note from H. Wu, August 2018: We changed our procedures by being extra careful and using Ebola-level PPE for anyone who might have met PUI criteria up front, even if it wasn't fully established before the appointment that they would meet the criteria.

Here's another simple sort of dilemma. I see somebody, and I say, "You probably have the flu. You need to start Tamiflu." Problem is they need to go home and be self-isolated. I can't exactly send them to CVS [Pharmacy] to pick up the prescription. [laughter] So there were situations where, sure, they had a family member that could do it. But there were other times where they lived alone, and they could get themselves home, but how are they going to get the prescription? We ended up just sending our administrator or nurse upstairs, to the pharmacy upstairs, to get the prescriptions for them. Who would pay for it? We didn't even know. In the beginning, I actually paid for the meds [medications] for some of these patients. I think our health system offered to reimburse me, but I'd probably lost most of the receipts by then. We just had to make it up on the fly. We'd never dealt with this before, a situation where we couldn't even send somebody to pick—an outpatient couldn't even go pick up his meds. As we went along, we eventually developed a billing account with the pharmacy, so we could find a way to pay for the meds. But again, this all was figured out on the fly.

Other odd things—the protective equipment we wore, we did not have the PAPR or the respirator. We just had the [face] shield. And the shields would fog up very quickly, to the point that you could barely see anything. This was a challenge. As a physician, I always had to try to examine these patients and look for a sore throat, look for strep throat [streptococcal pharyngitis]. On the other hand, our nurses had the tougher job. They had to draw blood in-clinic. To do this, when you have a fogged-up shield, literally dripping with condensation, this is not only a challenge. It's potentially dangerous. We tried numerous things. I took one snorkeling trick from my childhood and smeared toothpaste

inside of our masks, to see if that would work. Sometimes we used to do it, as a way to keep your mask from fogging. I actually sent one of our staff upstairs to buy toothpaste from the pharmacy to do this. I realized it actually does work, but the cost is that the mask is kind of fogged from the toothpaste, in itself. [laughter] So it's kind of the middle ground. It's not as bad as it dripping with condensation, but it was still not ideal. I knew there were special sprays you could buy, and potentially, anti-fog masks that were available. Certainly, we did put the requests out to get those. In all honestly, I never saw them. [laughs] They never came down. So this was the strategy. I knew that certain weather conditions, certain temperatures outside and relative humidities meant that we were almost going to fog up fast. In those situations, sometimes I did the toothpaste. Sometimes, we just decided the goal is, we move quickly. We get upstairs an—in fact, before I even do all my talking and everything, we get that blood. Because I already know we're going to draw blood, blood cultures, malaria smear, basic tests. Our nurse knew to get, right away, just drawing blood, even sometimes before doing routine vital signs. Again, this is not routine. This is almost unthinkable in any other situation. But this was the goal, to rush, to do things that require good vision before we couldn't see anymore. Other times, when it was very dry, it was a safe bet that the fog wouldn't happen or it wouldn't get too bad. But we just learned that this was our strategy. Sure, next time around, we probably should get the special equipment, to really not have to worry about it. But just an example of one of the things we had to deal with.

We also had another unexpected challenge in our freight elevator. This was an elevator separate from the regular ones that patients and doctors and staff typically use to get up

and down. We're on the seventh floor of a medical office tower, Emory Midtown. It is a crowded building. The elevator, on a good day, is packed. So there's no way we're going to take a high-risk patient in the regular elevator. A part of our routine was we would meet the patient in the ambulance entrance, with the security detail. Security was also trained to put on some protective equipment. We would get escorted through the—you know, in the basement level of the hospital, and go to this elevator. Security would clear the way. The elevator would be called and if somebody was in the elevator, the security would tell them to get out, and we would get in there. It turns out that elevator is quite busy too. There were days where we waited five to ten minutes for the elevator, and when we did see it, it was packed. These folks would be alarmed when they come out to see this team in protective equipment—and told by the security officer to clear the way and take a quick exit to the right. Certainly, there were plenty of awkward moments, where both staff as well as patients saw the team traveling, that caused small alarm. But I would tell our patients, reassure them, "Don't worry about all this, this big parade. It's all per routine." And especially if they were Ebola response workers, they were used to the routine. Because they'd dealt with all the special protective equipment while they were in Africa and all the way back home, all the requirements. I told them, "This is a special elevator. There are three folks who routinely—patients who use this elevator. All the regular patients go through our elevator, the main elevator. But our Ebola rule-outs use it, our VIPs [very important people]—folks, say—if you were ultra-famous and you would have a commotion if you just kind of walked through our lobby, you'd get escorted through this elevator. Finally, the convicts, the folks who are being brought in the chains and everything. That was actually quite frequent. We once, during a drill, were going into

the elevator and it opened up and there is a guy there in chains, with police officers. All these things were the things we had to think of, doing this.

There was another time we exited the elevator, came back on our clinic floor and came through the lobby. We were doing a relatively light rule-out. This one arrived late, and we were going to see them in our clinic at about five o'clock. I thought, okay, perfect. Everything's going to be empty. And again, there is no way to be totally invisible. Even though we took this back elevator and went through these ways, we still had to pass through, unfortunately, our main clinic lobby. During the daytime, sometimes there would be some alarmed patients. But our staff knew well—warn folks, “Don't be alarmed. We're just taking extra precautions.” That didn't stop some patients from getting alarmed and getting a little, occasionally, dramatic. [laughter] But this time, after hours, at five o'clock, I thought, okay. No problem. It's going to be empty. But, of course, we actually share that clinic waiting area with the bariatrics clinic that is across the hall from the infectious disease clinic. It turns out, that day at five o'clock, they have a group session with folks who may undergo bariatric surgery. There was this large group session going on, and we literally passed through with all this protective equipment. They undoubtedly had a few alarmed looks on their faces.

But that was the reality. There was no clean way to do this. First and foremost, our main goal was obviously safety of everyone. But sometimes we had—it was not necessarily possible to avoid these awkward situations, where we would be seen. It did lead to some problems. We did have staff, both who work downstairs near the entry point, as well as

clinic staff on our floor, who complained that this was—“Is it safe? Should we doing this? Shouldn’t all these folks be going to the Ebola unit?” There was even an—I don’t know where it came from, but there was an accusation that we were seeing folks like Ebola patients and not telling folks, as if there were more Ebola cases than—this goes back to the paranoia that hit Atlanta and the country, when we first accepted our first Ebola patient. “Why are you bringing those folks in? You’re bringing dangerous infection to our community.” I think that led to a little bit of paranoia that what we were doing was secretly seeing Ebola patients and not telling people. There was things like that we dealt with.

Q: Was that visitors or staff who were considering—

Wu: Far as I know, that was staff. I heard that those thoughts came in. In fact, we had a totally unauthorized group from within Emory poke their heads in and say—what I mean by “unauthorized” is that they were in an infection control group but did not even have jurisdiction over our clinic. But they heard some rumors and decided to come poke their heads in, and then came to ask what we were doing, basically. At that point, we already had the full support of the administration and [the Emory Healthcare Department of Infection Prevention and Control]. There was nothing covert about this. But it also was a lesson that we really had to get the word out, assure folks, this is well thought out, we’re doing the best we can, and the protection of everyone is our foremost concern.

We developed something called the Code Buddy. I'll tell you where that term "buddy" comes from. Part of the procedure that our Ebola team and the treatment unit set up was that you had the nurse or the doctor that was in the room taking care of the patient, but they always needed somebody on the outside, watching things. "There was a spill there. Did you see that?" Or, "Watch out. You just touched yourself on your face," or something. And on top of that, to help call for an extra tube of—a blood-drawing tube or something. You needed that extra help, that extra hands there. Because when you're in there, you can't really—we're not really free to do everything. We developed that procedure, adapted to our clinic, where we had somebody sitting outside the clinic door at all times. That was usually our LPN. She was very good at it. Her job was to sit right there, door open, while we worked on the patient, and make sure we did everything right, and would point us out with anything. She would help hand us equipment and things like that. She was known as "the buddy." That became kind of the code word. Whenever we activated our procedure to see a patient, our administrators knew to call a Code Buddy, where they would basically go around the whole floor, to the other clinics on our floor, and tell them, "We have a Code Buddy." What that meant was, don't be alarmed. There will be a high-risk patient passing through.

We did this because the very first time we were practicing this procedure, there was concern from other clinics in our floor, physicians and nurses, that again, "Is it safe? Are you putting us or our patients at risk?" And again, we were able to assure them, yes. We certainly took their concerns into account too, and found a space that was separate from our original clinic room that was even more isolated and separate from the other clinics,

to really minimize visibility and contact. And then, on top of that, developed the Code Buddy system, alarm system, so that they would be expecting it and be prepared to tell patients, “Don’t worry about that,” and know what to tell them. That turned out to be very important, obviously, just to reassure everybody, and in the end, just make it routine. At the time, we accepted this as just—accept this. This is the new normal. Until Ebola goes away, this will be normal.

Since then, that mentality goes on. Even though the Ebola epidemic hasn’t had a flare-up for a while, MERS has been a problem, 2015, the large MERS outbreak in South Korea, in healthcare settings. We are applying the same sort of procedures and things, screening, across our health system, to that. We have to face the fact this is our new normal, that there is always going to be something out there that is going to take a little bit more precautions to protect ourselves, patients and everything. Before Ebola, this was never, ever even thought of. Even though, yes, we had a problem with SARS, and MERS had existed, the reality was that the US, we got lucky with SARS. We never had a big problem, like Canada did. That mentality that thought that this could be a routine thing never settled in. After Ebola, I think the lesson is that this is really a critical area of preparation. Again, MERS is not going away. We have seen rule-out MERS, in the last year, particularly after large migrations to the Middle East, like the Hajj pilgrimage. And folks who have come directly, from—after traveling, it’s a new aspect of healthcare, not just infectious diseases or travel medicine, but emergency medicine, infection control, that we have to be prepared for infections that are not only dangerous to the patient. We were always aware of things like malaria or meningitis that could kill a patient very

quickly. But now, these are things that can be disastrous to staff and other patients. So it really is a new dimension in this, and that we are, to this day, still figuring out.

Again, a lot of big questions. Who pays for it? Who pays for all this training? To do these procedures takes a lot of training and practice. Is it better for everyone to be prepared, or for there to be a few centers that can do this? I'll give our state of Georgia a lot of credit. They've really been on the forefront of state preparations. From early on, they developed a lot of procedures for how to transport a patient across the state, to get them to the Ebola assessment centers and the Ebola treatment units. This took a lot of planning and figuring out, on the fly. But I think our state, as well as CDC, has really done a great job with Emory to take care of a lot of folks in the state.

Q: So I have the question, who does pay for all of this? Is it the state? Or who is—

Wu: I think the best answer is all of the above. I'll be the first to admit that I'm a little ignorant of a lot of the details, in terms of who's paying for what. As a physician, it's easy to not even think of that. But when it comes to things like transporting patients across counties and things like that, the state certainly has stepped in, covered it. CDC obviously plays a large role in terms of their quarantine officers in the airports. CDC has always also had a contract with Emory. Now this is actually a—the contract that originally led to the building of our treatment unit, long ago. Long before I came to Emory, that treatment unit was there. They weren't expecting Ebola. They were expecting, I think, more like a smallpox accident in the lab and somebody needed to be

taken across the street to get care. And that contract still has—if anything, has been expanded since the Ebola epidemic. Because again, if CDC staff members are sick, they need a way to get properly cared for. And obviously, there have to be assurances that somebody would pay for it, so that somebody wouldn't be turned away, or there may be big questions about the bill afterwards. Again, the goal is to take care of those folks.

At the end of the day, I think Emory has really absorbed a lot of costs, whether it's really small things like the PPE that we use, the little costs here and there, or the money out of my pocket to go for those—you know, Tamiflu. A lot of the time, even though the clinic was slow, we did occasionally cancel visits. We might have lost business. We took a risk. We knew that financially we may take a hit. But we just knew it was the right thing to do. I think, at the end of the day, our emergency departments are way too busy to deal with the greater loss that would have happened, had all these folks gone to the ER—and a lot more of a financial—as well as a danger to the community, in terms of patient care, if all this had gone to the ER. I think it's—yeah. I don't even know if all the accounting's been done yet. But I do think the costs were absorbed across the board. Certainly, I'm glad the outbreak is over, for many reasons, one of which is financial reasons.

I do think it's part of this new medicine I'm describing, of being prepared for these things. It's not just the preparation and the protective equipment. It's also figuring out who pays for it, at the end of the day, too. Because at the end of the day, you want to do the right thing. But you certainly don't want a patient or a health system to get penalized with a huge bill, just because somebody was doing the right thing and going to respond to

an outbreak, and then coming home and getting a huge bill. Or a hospital stepping up and saying, yes, we'll take care of these patients because nobody else will. I certainly do agree that it is better for certain centers to have more specialized levels of care. That goes back to the CDC's model of treatment units, assessment centers, first-line providers. But if folks are going to step up and do the right thing, we also have to assure folks that they're not going to go into the red, or further into the red, by doing it.

Q: I appreciate the description of this kind of new field, or emphasis on emergency medicine, that part of it—so much of what you're doing is not just preparing for the physical realities of what might happen, how a disease might spread, but also dealing with the social aspect of it. Much of the reason that someone has to come up in a freight elevator—part of it is isolation, but part of it is also so that nobody freaks out unnecessarily.

Wu: Yeah, that is a really good point. I'll tell you another interesting thing. If you recall, the first Ebola patient that came to Atlanta, that was a media circus. I didn't even come to Clifton Road. We're based in Midtown, and I didn't even bother coming to this part of town because of the rows of reporters and everything. That level of scrutiny and attention really did not die down, through most of the epidemic. It was clear that reporters scan the EMS—sort of radio waves. There was one PUI I saw in the ER who had been triaged directly from the airport, I think identified post-travel with symptoms, appropriately transported over. And somehow the media got a hold of the—the report said a possible Ebola patient was headed to Midtown. I literally was seeing this patient, and on the TV

above us was a live feed from a helicopter above us, and a reporter outside. Basically, they chased the ambulance all the way to the hospital. Fortunately, the patient thought it was all amusing. But it was a little hectic, in that sense.

I do think there was a lesson at some point after that, or at some point, to be using nonpublic channels for these sort of communications. The unnecessary media concern, it leads to a lot of excess, unnecessary alarm. We weren't doing this in secret, but at the same time, there was no need for every patient to become a spectacle—especially because these were all low-risk patients.

I should make it clear. In all of our rule-outs, nobody had Ebola. Again, all the cases of Ebola in the US were the ones that we knew about, except for that case in Dallas, and that were highly publicized and managed. But the good news is our screening and precaution systems were never really challenged with a real case, which we're quite thankful for. But I am confident that even had there been a real case, I don't think there would have been any secondary cases among our staff members or the community. I think the precautions we took were adequate. But you're right. That social aspect, the public aspect of it, it was very new. It was a challenge—again, not just for other patients, but even our colleagues.

Q: When somebody from the public, when somebody visiting the clinic or whoever, had let's say an adverse reaction to seeing somebody in lots of PPE, what form would that take? Are they demanding answers, or do they just have this look on their face?

Wu: Mostly just the look on their face. The good news is, there weren't any major sort of—disastrous PR [public relations] or—you know, nobody fainted. Nobody had a panic attack. More than a few folks had to be reassured by our staff. “Oh, don't worry.” We did a lot of drills to practice this. And even with drills, people get alarmed. Even if we said, “This is a drill.” I got the feeling that, over time, even if patients had never seen it before, by the time we got later in the epidemic, I think they were just so used to the fact that this sort of stuff was happening, that there's Ebola out there, everyone's being extra careful, that it was much easier for our staff to reassure folks. After what happened in Dallas, we would just tell them, “We are just being extra careful with anybody. It is not any reason to be alarmed. In fact, you should be reassured that we are doing this because this is what's protecting you.”

That was the irony to all this. I think, on one hand, a lot of patients canceled appointments to Emory because we were the Ebola hospital, now—they would even cancel appointments to Midtown campus, even though we're not even the same campus where they were taking care of the Ebola patients. And yet the irony was, we were the most prepared to deal with an odd case were it to slip through the ER or the clinic. If anything, other clinics were definitely not doing what we were doing in terms of screening folks. We certainly got transferred folks from other clinics, where literally, the patient made it all the way back, with no precautions, and by the time the doctor or nurse got the history, “Oh! This person just traveled to the Ebola area. Oh no. And he has a fever now. What do we do?” And now this patient's already gone through the waiting

room, the triage area. Obviously, with our precautions in place, we were probably one of the safest hospitals out there during the period, because we were watching out for these things. I think that's the irony of it.

I think some of that extended into our screening procedures, which we do to this day to look for patients who might have MERS. If you make an appointment at Emory clinics or go to our ER right now, you'll get asked—when you're admitted, asked if you've been to a country where there's MERS activity and if you have symptoms. If there's a positive screen, then that immediately goes up a channel through the Department of Infection Prevention and Control and often ultimately to me, where I collect some information and go over the CDC criteria and say, "Okay. You do not make criteria. Sorry for the inconvenience. We're just being extra careful here," or occasionally, "Yes, you do meet criteria. We have to take some special precautions," and actually, sometimes have had to transport folks to our ER so we can do a MERS evaluation. That's the new normal. It is important, though, that we not go overboard, and that the idea is to screen folks with these things that potentially are an immediate danger to the patient, to the doctors—physicians and their patients.

Zika's been the disease of the year this year. Certainly, a lot of valid concerns, from both physicians, the public, and the CDC, on this disease. We are often asked at our meetings, "Should we be screening for Zika? Should we be asking, 'Have you been to a Zika-affected area?'" And we haven't. I am, in particular, of the opinion that while it's of major medical and public health importance, somebody with Zika in the ER is not going

to be passing it to the whole ER. We don't have mosquitos flying around. [laughter]
Which is standard precautions. It's not going to be the epidemic that MERS or Ebola could be. That said, doctors should be asking about it. It's important to identify the cases. But in terms of that first-line triage, before you come to the door, "Have you been to this area?" I think that's not the right thing for Zika.

Q: Another question I have. It sounded like you were saying that returning responders and people at risk would have a difficult time finding basic medical care elsewhere, besides your clinic. So your clinic, in a way, was a refuge for some care for these individuals. Is that an accurate characterization?

Wu: That is. There was even a case where somebody—actually, it was not even an infectious illness. Somebody, if I recall, needed a refill on some psychiatric medications and was unable to even get through the door of their regular clinic. There were odd situations like that, that I'd never dealt with before. Or there were times where the health department called us and said, "Hey, this person is under that twenty-one-day monitoring quarantine. They have some basic complaints, not Ebola symptoms." But again, there's nowhere—where else can you go? But they just need an urgent-care clinic, and we're basically the only place that would say, "Sure. We'll see them," and not be alarmed by it. Again, this was all so new, I wouldn't expect any urgent-care clinic or an ER to be prepared.

We wrote an editorial in the *Annals of Internal Medicine* saying that ambulatory care centers should start thinking of these things. The purpose of that wasn't to say everybody should train to put on suits and be prepared to [treat for] Ebola. I think our main issue was, everyone should be able to screen and identify somebody and have a plan of what to do, whether it's call the health department, transport them to an assessment center—or if they are equipped to evaluate somebody, sure, get that in place. But the idea is to be prepared and not be the clinic that is caught off-guard, because you have somebody in- clinic who might meet criteria.

But it is true. Again, even folks who didn't meet criteria had trouble seeing their doctors. We had calls from concerned clinics about patients who had not even gone to Ebola areas, but they were in Africa. Often, you get folks who kind of assume that the whole continent is a potential risk—again, part of the alarm. A number of times, we saw folks who had no symptoms of illness, and they required a letter from a doctor saying that it was okay for them to go back to work. Some of them had gone on Ebola response. Some of them were actually not on response, but they had family members who went on response. And somehow, word got out to their employers, whether it was the school district or company, that they had a family member who had been to an Ebola area. And they were told they couldn't come back to work until they got cleared. We actually saw a handful of folks who came to clinic to get a letter signed by me, essentially saying, they meet no criteria whatsoever of a person under investigation. Their activities are not restricted whatsoever. We did a handful of those, something that was almost unthinkable before Ebola but became somewhat routine.

Q: Did you ever have patients coming in who were themselves concerned, they're undergoing, like, flu symptoms? And if so, what was it like talking with them?

Wu: I would say most of them were a little nervous, as I'm sure I would be, coming back with a fever after going to a place like that. Most of them took it quite well and understood the situation, especially if—a lot of them were responders, and so did have either medical or public health backgrounds, and kind of knew the drill, and understood, we just have to take these precautions, even if it's unlikely Ebola. I'd say most of them were quite fine about it. They were always very relieved when I called them up and said, "Hey, the flu test was positive. I think this is probably all it's going to be." Some of them actually thought it was—got a kick out of it. I've had PUIs take selfies with me while I was in PPE and things like that. [laughter] I saw folks that I had known from other parts of my career in our clinic. It was a very interesting experience.

Q: I appreciated when you talked about wanting to highlight the work of your staff at the clinic, nurses and administrative staff, etcetera, and their role in everything. Are there any interactions that stand out to you, when you look back, or anything you'd like to highlight?

Wu: I think, in the end, I really have to give a lot of credit to our—a couple levels—our hospital administration. I have to say, early on, I went to some meetings, and when I discussed some of these early cases, PUIs, "What do we do?" It was frustrating. I felt like

they didn't always get it. And why would they? This was so novel. And on top of that, they saw the media circus that happened with those first cases. One of my early frustrations was, oh, my gosh. They're more worried about a media circus than they are about just getting this patient the care they need. And again, it wasn't the case. Me, as a physician, I'm just thinking, "How do I get this patient from point A to point B, get their malaria treated? I can't believe somebody even brought up media issues during this discussion." It just took a lot of figuring out on the fly. But once we got a better feel of it, top down, medical officers and department chairs—full support, taking into full consideration every aspect of the care.

Our interactions with the state health department were extremely productive. When the state epis [epidemiologists]—Laura [S.] Edison, we worked very closely with, both in terms of being referred patients, as well as discussing cases with them that they were monitoring. We worked closely with CDC. In fact, all of these folks had me on their cell phone call list. And I had their numbers, too. Because we were talking so regularly about folks getting referred, about folks we were seeing and discharging. Part of the huge response here was just monitoring an enormous number of folks who have traveled—CDC monitoring their employees that returned, the state monitoring other folks who had returned. It was a huge undertaking. And when any of these folks got sick, figuring out where they can get care—I think it was amazing what we figured out and got done, with clearly some bumps and lessons along the way. But I think, at the end of the day, we did it quite well.

It's not just Emory, too. Susan Ray at Grady [Health] got their program to see these evaluations up and running pretty quickly—very quickly. She was discussing with me, “How are you guys doing this?” We were basically sharing notes on how to implement these things and do it correctly. I think it was very positive, when you look back, seeing how everyone stepped up and did something that had never been done before.

Q: Are there any other memories that you have that we didn't discuss, or anything else that you'd like to say to make sure we have it on the record?

Wu: Let's see, here. Any other—[pause] I think I've covered most of it. I really want to emphasize that all the training I ever had, both medically, infectious disease, public health training, did not prepare me for this. I think I really want to emphasize that. It was just such a new situation. And just like the responders, the folks taking care of Ebola patients in Africa, they were doing things that—they were doing the best they can in their situation, whether it was in layers of PPE that almost made it impossible to do the things that would be routine for taking care of such sick patients—on our end, we were doing a lot of things that, in any other circumstance, I would have been horrified. The thought of, before you ask any questions, draw blood—things like that. As infectious disease physicians, we try to be judicious in our testing and treatments. But this was very different. We talked about, okay. There'll be times where we'll just treat empirically for malaria. Because we're not going to have the tests back right away. And it's a dangerous infection on top of that. If we can make these fevers go away, we can relax a little bit and the patient will be much happier. It was really one of those times where I just realized,

you had to be creative, you had to use every resource you had, and get on the phone a lot, talk to—whether it’s somebody at CDC or the state or Infection Control [the Emory Healthcare Department of Infection Prevention and Control], saying, hey, here’s the situation. And not even knowing what the answer’s going to be. You realize that you’re making it up as you go along because this was all unprecedented. I think that was the lesson. I’m sure this happens with any big kind of event like this. And it’ll happen again. But the next time it happens, I’ll think I’ll be better prepared. I think I can recognize now, okay, this is where our current guidelines stop helping us, and this is where we have to start coming up with the new ones really quick. I would say that’s sort of my lasting lesson from that whole event.

Q: Thank you, so much, Dr. Wu. This has been great, listening to your experiences. Thank you for being here and giving your time.

Wu: Thank you very much. I really appreciate the opportunity to share this. I hope my lessons can be passed along for the future.

[break]

Wu: One more thing. As I mentioned, the confidentiality issues. We did our best, obviously, to protect confidentiality. But again, we had to sort of improvise. Our “buddy” was out there with the door wide open. This was not a closed-door exam. Now, we didn’t do anything terribly invasive, but it was very awkward. I’d never examined patients

before with the door wide open and a third party sitting outside watching. And things like, how do you get consent from somebody who—you know, you can't hand them a pen and a sheet of paper and say, "Sign this." We got approval to do verbal consents. So what we literally did is show them a copy of our standard consent form and say, "We're going to take verbal consent." And have our administrator standing outside and say, "Do you consent to care?" They would say, "Yes." And I would just throw that blank, unsigned copy into the trash. [laughter] Because anything going into that room, essentially, in theory, was contaminated. In fact, when we left the room, I would joke with them, "Make sure you got everything. Because if you leave your cell phone or anything here, it's going to go into the incinerator." So that was—yeah, we had to figure it out.

Q: [laughs] Was that reality? Would it probably have to go to the incinerator?

Wu: Actually—here's the deal too, and a minor detail here. The good news is, because we had low-risk patients, we didn't necessarily have to autoclave our trash and do the extra treatments that our Ebola treatment unit had to do with their trash, with those confirmed cases. We always had to be prepared for the possibility that there might be a possible case. We worked out with our Infection Control—basically, our trash was handled carefully in that until we were confident that the patient did not have Ebola—we could usually come to that conclusion pretty soon, if not by the end of the visit, but maybe by the time we got initial lab work back—we were a little extra careful. The room would be cleaned by custodial staff that took extra precautions. We would package the

trash ourselves. Nurses, doctors, we would package it up. Then, once we made that decision, this patient is low-risk enough, we got permission that it was appropriate for that trash to go into the regular stream. It still gets incinerated, as all medical trash does. But at least it doesn't have to go in the separate hazmat [hazardous materials] truck or the autoclave first that the Ebola treatment unit was doing. But again, this was always on our minds. It was, again, figuring out on the fly and then making the best of what we had. It wasn't perfect, but I think it was certainly more than good enough, in terms of being protective and taking the proper precautions.

Q: There's so much to think about.

Wu: Oh, yeah! Again, we did drills left and right, just because every time we did a drill, we'd be like, okay, we didn't think of that. [laughter] You know, the elevator just took ten minutes, we've got to think of a way around this. We adopted a lot of the procedures from our Ebola treatment unit, but again, we had to adapt them. Because their protocols were designed for their treatment unit, not necessarily for an outpatient clinic. We had to adapt those, but we took a lot of their lessons. It was a very interesting experience.

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