Pulmonary Hypertension and Telehealth in the Time of Coronavirus Disease 2019

This winter our Guest Editor, John J. Ryan, MD, MB, BCh, BAO, co-director of the Pulmonary Hypertension Program at the University of Utah in Salt Lake City, gathered with Jennalyn Mayeux, APRN, DNP, coordinator of the Pulmonary Hypertension Program at the University of Utah in Salt Lake City, and Mark Avdalovic, MD, of the Pulmonary and Critical Care Division at the University of California Davis, to discuss the impact that coronavirus disease 2019 (COVID-19) has had on clinical practice and the challenges and possibilities of telehealth in the world of pulmonary hypertension (PH).

Dr Ryan: We're delighted to be joined here today by Dr Mark Avdalovic, a pulmonologist and critical care faculty at the University of California Davis (UC Davis) Health, and by Jennalyn Mayeux, DNP, from the University of Utah Health Division of Pulmonary Medicine and Department of Internal Medicine. Thank you both for joining us.

The reason we're here is to touch on the clinical impact of the COVID-19 pandemic on our clinical practices. As we all know, it's had a transformational effect on healthcare delivery and we really want to get the details from you as to how it has impacted your clinical care and how you have adapted to it. Dr Avdalovic, within California there seems to have been an earlier wave in terms of COVID-19 in your region. How did you react to this and what adaptations did you make?

Dr Avdalovic: Thank you for inviting me. Here at UC Davis Health, with regard to the PH program, we had already started a telehealth outreach as part of our everyday business in terms of taking care of PH patients prior to COVID. I happen to lead the UC Davis Health telehealth program as well as leading the PH program, so I had been working fairly aggressively over the previous year to get all of our service lines to try and do at least 1% telehealth for their visits to help accommodate the large geographic outreach we do as a health system. Patients come to us from as far away as Oregon and sometimes even Arizona, so we have an almost 1000-mile (1609-km) circle that we have to accommodate.

For many of these patients, driving here for every one of their visits is not convenient, and for PH patients in particular, so we already had the infrastructure in play for telehealth. We knew when the pandemic first hit that we had to, number one, be careful about who should really come and physically see us. We incorporate a risk calculator, which I know many health systems probably have, weighing the contributions of things like age and preexisting illnesses in the likelihood of having a COVID complication. Those who were at pretty high risk and who were deemed as essentially a usual-care follow-up, maybe for touching in on how they're doing with their medications, their symptoms, new side effects, things like that, where perhaps the physical exam is not absolutely essential at that visit, we steer those patients toward telehealth. I would say that summarizes some of our initial accommodations in March, April, and May.

The other thing that's definitely affected us, and I know it has affected all practices for PH, is that the ventilation/perfusion (V/Q) scanning that we normally would like to have is no longer really offered by our radiologists. They will not do the ventilation portion. We're stuck with perfusion only. That has definitely created some issues, so we have to sort of combine computed tomography–scan lung images with perfusion on a V/Q to get the information we normally get from a full V/Q.

Similarly, for full pulmonary function testing (PFT)—that is, spirometry, lung volume, and diffusing capacity—we have to have those patients have a negative COVID test within 48 hours of having the PFT. The process of scheduling not only their PFTs but now a COVID test, usually done as a drive-through, then following up on that and making sure it's negative, then getting the PFT, that has certainly added to some of the administrative hurdles of the pandemic.

Certainly, some of our approaches have made it easier to maintain as full a clinic as possible. I will say that even with all of these attempts to make things easier for patients and seeing them via telehealth, we are at approximately, I would say, 80% of the clinic traffic that we normally would have at this time.

Dr Ryan: Great. There's a lot to build on there. Jennalyn, if you could weigh in about the changes you've made at the University of Utah program and how things have adapted both in the early stages of the pandemic and 9 months into it?

Dr Mayeux: We have had some or all of the same challenges, particularly with V/Q scans, PFTs, and the interruption of our traditional testing schedules and routines for our patients. In the beginning, our platforms were not readily accessible. There was a big learning curve for us and our patients because we did not have that infrastructure for telehealth built into our program yet, but we had some excellent staff that really helped us push through, and now we've used a couple of different platforms.

Our patients overall have been really receptive to it. The first few weeks and months we were getting so many questions about COVID, about risk, and I think there was a lot of appreciation from our patients to have this platform where they could still reach out to us and still have conversations, know that

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their care was still available and that their concerns were still being addressed, but also to give them some reassurance about what was going to happen in the months ahead of them. We also serve a 5-state region and the geographic distances are really challenging. I do have hope that in the future we can continue these telehealth programs and continue to improve access for our patients.

Our clinic visits are up despite the challenges on our pulmonary side and the attending schedules with COVID, so we have stayed busy. We still try to accommodate patients who are less familiar, less sophisticated in their technology adaptations. Patients with language barriers, we still bring them to the clinic, but we've really tried to reduce the amount of traffic in our clinic flow; we've each taken days to be present in clinic so that we can rotate through the rooms better. Overall there has been a lot of risk assessment from both sides with our patients, and it sends the right message that COVID-19 is a serious problem and we want to keep them as safe as possible.

Lastly, for the most part we've been able to keep patient care from being too interrupted, but as Utah is now surging, we've had more challenges with scheduling all of those long lists of procedures and workups that we want to bring patients from out of state in for. We're still getting them done in a semitimely fashion but it's definitely interrupted our testing.

Dr Ryan: That's very insightful from both of you. You both highlighted the initial response in March, April, May, but now we're in a kind of business-as-usual October, November, December response. I think having to transition has been, as Jennalyn said, a steep learning curve, and adapting to it has been important.

Mark, I wanted to touch on the people we're missing. You commented that the normal clinic traffic is 80% of what it was. Just to be explicit here, the 20% missing haven't gone away. They still have disease, and, as we know the Pulmonary Hypertension Association (PHA) has been a good advocate for, a large number of people out there with PH and pulmonary arterial hypertension are not getting diagnosed or getting diagnosed late. It sounds like both of you have set up good infrastructure for telehealth visits, but how do we reach that 20%? Who are they, and how do we reach them?

Dr Avdalovic: One thing I'm not sure of is which electronic health record you all use. We are on Epic. We were able to create, essentially, a workbench report that looks for patients who have been lost to follow-up. There's an algorithm that's applied and it is specific to the clinic that is asking that question. You have to log in under the clinic-specific Epic department and you can run a report over whatever time frame you want to look at. We like to look at the last 4 months, patients who were given an appointment and either never showed up, or asked to cancel and then never rescheduled. At some point, someone said, "I want to see you," and somehow that appointment never happened, whether it was a no-show or otherwise.

Also built into this report is the more generally truly lost to follow-up, where some of our patients choose to make their appointments at a later time. I may say, "I want to see you back in 4 months," and they'll say, "Okay, I'll make that appointment a few weeks from now," and then they don't bother. Well, we can search against that original request for 4 months, which is placed in the discharge portion of my note.

I'll be honest, in the beginning it was a little humbling how long that list was of patients who had been lost during this time, and so we're actively identifying them and reaching out to them. What we're finding is that some of them simply either can't do telehealth because of a technical reason—so we do offer telehealth via just simply a telephone call. We do try and make it as simple as possible, but in terms of being seen in person, many patients just feel very nervous about coming here, so we've tried to accommodate them as much as we can.

To answer your question, number one, we're trying to use the tools that are available to us to identify these people who've been lost to follow-up, but there's the other part you mentioned, which I think is equally important, that there are folks who are being worked up by our community partners and maybe that process has slowed down. When we see that, looking at our total referrals, they are down a bit—not a huge amount, but definitely down, particular during this time of year, when we'd be seeing a bit more. Compared with last year I think we're about 10% down on referrals. I do think that reflects what you brought up, that in the community patients aren't coming to the office, they're not being seen, and their symptoms are not being addressed.

Dr Mayeux: Yes, my concern is that the patients we're missing are the patients who need us the most. Those with low levels of health literacy, who don't understand, maybe, that we lose ground and may not get it back, or it may take us a longer time to get it back. We've done the same thing. We've tried to comb through charts. We are clearly not as able with Epic to pull the things that we probably should be able to, but we've done a lot of manual searching. We're catching patients whose med refills are coming up and we haven't seen them, patients who've made appointments and then canceled them.

Really, I think there's a fear of what telehealth is. There is some idea that the value is different by having a conversation and not having that hands-on physical assessment. But I find that our visits are longer. I ask more questions and actually find out probably more about the patients in those visits to really address what their concerns are and what their goals of care are and how can bridge the gaps between their concerns, their safety, and their health care.

Our referrals were slow in the beginning. We were able to get patients in really quickly at first, and now we're back to our usual referral times, as in the past. But I don't think our community referral sources are doing as many echocardiograms to catch those elevated pulmonary arterial pressures. I don't think that the testing is as robust for bringing up these abnormalities, so we are seeing that, too. The telephone calls have been invaluable, knowing that we

can still have those good conversations with patients over the phone. Being able to be reimbursed for them, quite frankly, makes them a very good option for our patients. It does take a lot of phone calls. We write letters to patients when they're not coming in to try to reach them, but I will always be concerned that we are losing the patients who need us the most.

Dr Ryan: We've known already that there's a delay in referral to us, and I think what this has highlighted is that there's probably even more of a delay; or at least, any ground that would've been gained through advocacy programs, raising awareness of diagnosis, may have been lost because people just aren't going in to see their providers and then, as you rightly point out, there's a delay in doing an echo.

I want to touch on the diagnostic workup. With the barriers now for PFTs and V/Q scans, how do you prioritize people for diagnostic workups now? Do you anticipate that we're overdiagnosing Group 1 now, or missing Group 3? What are the consequences of these challenges to doing the thorough diagnostic workup? You look at the traditional McLaughlin and Archer 2009 American Heart Association/American College of Cardiology Foundation consensus statement, and that long list of testing is very hard for primary care providers to do. I think a large part of PH programs are acting as diagnostic centers. You can call up and say, "I have symptoms of PH," and traditionally we would have said, "We'll take it from here." Is that harder to do now?

Dr Mayeux: I think a lot of our challenges come internally from patients. They may want to have a conversation with us, but may not be excited to go to the PFT lab when they hear COVID testing is involved. Certainly, I think there's lag time there, particularly with those patients who were not straightforward. Those patients who are most likely Group 2, Group 3, are not able to get those sleep studies as quickly because they may not be doing titration studies within the sleep labs, so we're having a harder time discerning the groupings for those who definitely have overlapping comorbidities.

Then there's actually getting patients to come in for testing. It is easy to say, "You're going to have your echocardiogram at 11:00, your PFTs are at noon, and we'll see you in the office at 1:30." That algorithm has really changed with COVID testing, and with our office constraints as we try to reduce the traffic in clinic. I think we can still get the testing we need, but it's just more difficult with patients' desires, and then the ability of what we can do. We cannot do, for example, maximum inspiratory pressures and maximum expiratory pressures in within our PFT lab, but we can get the basic PFT. We can really look at patients and find those who are highest risk; we can still do tox screens so we can still find those methamphetamine (meth) users. We can still do a lot of the tests that help us stratify these patients, but it's the nitty-gritty, the perfusion scans with the ventilation component, the sleep studies; Group 3 patients are probably the most at risk of being lost.

Dr Avdalovic: I agree with what both of you have said, that part of what we do as a center here is the diagnosis and categorization of one's PH. Most of the referrals that come to us, the referring physician frankly assumes that the patient has Group 1 but has not done a complete workup. Our rates of identifying patients who have true precapillary disease that may benefit from vasodilator therapy is probably about 60% or 70%; the rest are reclassified into a more appropriate category. The group that ends up being reclassified, or appropriately classified, most frequently, in my opinion, is Group 3, and so that is the group that ends up being at risk with the lack of PFTs being as robust and frequent as we'd like; that is the group that I have some concern about.

Certainly, I think there is also some concern about Group 4 patients being missed and being misdiagnosed as Group 1 because the V/Q is not as precise as it is when it's done as a true V/Q. I would say that we're certainly not missing any surgical disease. That would be unusual to miss. It's interesting, as part of our office, that we have increased how many pulmonary angiograms we do. We probably didn't do as many this time last year. We might have done 5 or 8 pulmonary angiograms in a year and now we're doing quite a bit more. We might do 2 to 3 a month, just to be absolutely sure we're not missing something. That has definitely changed some of our workload.

Dr Ryan: I do think as well that there's an opportunity to use some scoring. Pretest probability, I think, has had a big impact as well. We do have the scoring systems such as the OPTICS scoring system that was recently published by Harm Bogaard**,** and then the VEST scoring system by Anjali Vaidya. We get an idea as to what is the likelihood of Group 1 versus Group 2, and then, with the pretest probability ahead of cardiac catheterization, in terms of trying to help people decide, "Do I really need a right heart catheterization? Is a right-heart catheterization here going to change my practice?"

If you have a 70-year-old male with a body mass index of 40 and an apnea-hypopnea index of 40 and nonadherent with continuous positive airway pressure, your right-heart catheterization is probably going to have a high wedge and high pulmonary artery pressures, and you're not going to start pulmonary artery hypertension–specific therapies. But if you have a 30-year-old woman with scleroderma and a blown-out right ventricle with interventricular septal flattening, it's more likely that you're going to have an impactful right-heart catheterization. I think that those are useful in terms of decision making for some of the diagnostic testing.

Mark, I want to turn to you. We've talked a lot about the people being referred in and new referrals, but I also want to get your thoughts on established patients. Obviously we have not visited each other's practices yet, but like everyone else in PH circles we were doing echocardiograms every 3 to 6 months, doing 6-minute walk distance every 3 to 6 months, doing brain natriuretic peptide every visit. We had this standard protocol in place—that you come to see us and we do everything. How have you changed that—what is the routine

testing that you're now doing at that regular follow-up rather than relying on your *gestalt* and saying, "You know what, I think Mrs. Johnson is doing well," or "I think she's doing poorly." How do you gauge through the video chat? What objective measures are you using and how do you adapt to that?

Dr Avdalovic: Great question. I think there are certain techniques that we will occasionally employ during a telehealth visit. Number one, if they live in a 2-story house, I actually have them go up their staircase and come back down, and I'm looking to see how short of breath they are. Sometimes I will ask them very open-ended questions where I'm hoping that they have a very long response because I'd like to see how they do with a long multi-sentence response to a question.

One technique that I've adopted—and it's not my technique, I saw it early on in the pandemic—is to have the patient take a deep breath and then count out loud until they have to take another breath. Usually if you can get them to get to 30 then their functional capacity is at least reasonable. If they take a deep breath and then after counting number 10 or 11 they have to take another breath, that speaks to their lung capacity perhaps not being outstanding.

Those are little things that we do; however, at the end of the day, we are still trying to hit our calendar-specific targets for a patient. If that's a patient on a single drug that we comanage with a community physician—maybe on tadalafil, for example—we still want to see a yearly 6-minute walk and an echo depending on what else they have going on, maybe a PFT. Whereas when they are on 2 drugs, that frequency is close to every 6 months. If they're on 3 drugs, we're certainly getting an echo every 6 months and we might even cath them every year. It depends, but we're still trying to hit those basic targets as much as we can.

We are using our community partners maybe more than we have before. We're willing to accept the PFT that's done locally for the patients rather than bringing them in and trying to do a really long visit that has the echo, the PFT, the 6-minute walk all in one day when it's hard to get those things scheduled given the challenges. We have begun to accept some of the community tests. I'll be honest, it is a little frustrating, particularly with echocardiograms—I'd rather see the images myself than read a poor report. It gets a little frustrating, but in certain case-by-case examples, you have to accept the best that you have available to you.

Dr Ryan: Thanks for that insight. I agree, I think it's hard to be as absolute as we previously were about that. I think there is an opportunity for all of this to be quite empowering for patients, that we can tell them, "You tell me your blood pressure, you tell me your heart rate, and you go and get your brain natriuretic peptide" and then we'll get the results sent over to us. I think there is an opportunity to empower patients, but again, there are some people who will say it's too hard, or they don't have the resources available. Jennalyn, same question to you: What are you doing right now in terms of follow-up? How are you getting a sense of how people are doing when things are remote, and how do you react to and accommodate that?

Dr Mayeux: I think more now than ever, shared decision making is on the table. Between, "Okay, you have a community hospital, we honestly can get echo reports that are 3 sentences no longer than 4 words per sentence," which doesn't give us all the information that we want but at least gives a little bit of an idea as to how a patient's doing; but maybe that saves them an overnight stay in the valley to keep them safe at home. Decision making between when we do the testing, where we do the testing, and even medication changes. Some patients are happy to say, "I don't want to change a thing right now but as we get more comfortable, we get through this," and then I'm more willing to have maybe a specialty pharmacy person in their home or via telemedicine.

I talk a lot about scales being one of the most useful tools that patients have in their homes to help us and keeping those records of weights, because that really helps us get some insight into how those patients are doing. Pulse oximeters—get them out in their actual visit and show me what their heart rate and oxygen levels are doing. Walking around the room, same thing, to see how their oxygen responds. I think one of the most helpful things is having patients go get their medication bottles so we know precise doses of what medications they actually are taking, and how much of a medication they may be taking, and how many days a week they may be taking extra medication.

I think listening to how well a patient speaks to us is very helpful. I do think that we're going to end up in a world of hurt because our patients are not going to the grocery store, they're not walking around Costco to get that everyday physical activity or a few times a week to help them judge if they're getting worse or better. Our 6-minute-walk protocols are a little different now and patients struggle with that; this may just be our facility, but some of that testing is hard. Deconditioning and functional capacity are going to be really hard for us to assess. What's just being in our homes, not walking in the parks, not going down to see the neighbor, versus what's actually disease progress? We rely on a lot of labs and labs that are done at outside facilities may not be exactly equivalent to our labs either.

Dr Ryan: One thing I want to touch on is that with any PH program, it's a team sport, right? We have our medical assistants, clinic coordinators, study coordinators, APCs, MDs, social work, etc., the traditional things that have been incorporated into the PH comprehensive care centers. When we were in person, it was very easy to be a team. You'd see each other. Looking back, it's hard to believe that so many of us did fit into one small room! How are you keeping your team structure and that sense of common purpose?

Dr Avdalovic: Well, I'm embarrassed to say that we probably, most of the time, still try to do it the same way we used to. Our clinic space is large enough, and it turns out that the half-days that we are here when PH patients are being seen, it just happens to be that it's most-

ly our teams that are seeing patients. One of their half-days that we're here that isn't true and we've had to make some accommodations, but for the most part our pharmacist or nurse coordinators are here.

If they can't be, we have incorporated this unique tool within our telehealth platform that allows us to invite up to 10 different participants. Theoretically, 10 different people could be in 10 different locations, yet still join in the same visit. Not that we've ever done anything that complex, but it is technically possible. We utilize that a little bit. One of our faculty actually had COVID and had to do his visits from home. He would join remotely to visits that were sometimes actually happening in the clinic. We've taken these approaches to try and accommodate some of the changes that have come with the pandemic.

Dr Mayeux: We have had changes. We've had staffing structure changes. Amidst the pandemic we are restructuring our program to incorporate more nursing, which is going to be amazing for us. One of the most valuable things we have done together is to start weekly team conferences via Zoom. We will spend a lot of time informally in the same clinic area, able to review both pulmonary and cardiology patients because we are a multidisciplinary program, but we have these—as Dr Ryan likes to call them—Brady Bunch sessions where we all get on Zoom and present our challenging cases and go through images all together. I think the access has even been better, at least from an imaging standpoint, because we can scroll through. We have 3 pharmacists on our team who are incredible and they can join in wherever they are, if their responsibilities are inpatient or in clinic, and we can really connect together as a team to try to keep in touch with what's going on and most effectively treat patients who have overlapping disease processes.

Dr Ryan: Great, thank you both for your insight. Another question I have relates to misinformation. There's a lot of medical misinformation, a lot of misinformation in general, unfortunately, in our society at the moment. When patients come to you with questions about COVID, questions about vinegar and mouthwashes and even vaccines—even the more sophisticated questions about vaccines—how do you handle those questions? What do you tell them and what expectations do you lay out, or what resources do you provide to them?

Dr Mayeux: I never shy away from saying that there are things we don't know, particularly things COVID-related. We have a lot of vaccine questions coming at us these days and our patients ask, "Am I going to be able to get it? Am I getting it? Will you tell me to get it?" I really try to be honest with them that I would never expect them to do something, like get a vaccine, that I would not be willing to give myself or a family member. We just don't have a lot of that information and that hard evidence. When we do, we'll absolutely share it with them.

In the early days, I had a couple of patients ask me for prescriptions for hydroxychloroquine, and it was really a long educational session about passions versus evidence. I try to keep these conversations as grounded as possible, make it clear that we're not trying to keep anything from patients, but we will certainly treat them the best that we possibly can once we have good evidence to provide them safe care.

Dr Ryan: Mark, same question to you. How do you guide patients and provide them access to high-quality information at a time when the information is evolving so quickly and there are so many areas surrounding COVID-19 that we don't know about yet?

Dr Avdalovic: Well, I think I usually try to gauge or assess where they're coming from and what their concerns are. I have to say—I'm trying to use my words carefully here—I don't want to say disappointed, but certainly surprised at how many of our patients did not and still do not take the COVID pandemic seriously, in particular because they themselves are not the healthiest of people. I'm frequently stunned when I get a question, as I did last week, like "You make me wear this mask every time I come to clinic, don't you agree that this doesn't really do anything? Have you ever even seen a patient with COVID?" This is as we currently have, I believe, 80 COVID-positive patients in our hospital today. It's been stunning. I'm sure we all agree that this part of the conversation was one that we didn't anticipate, that the public health component would be so controversial.

I try and push them towards resources that I trust—our university has a website with frequently asked question about COVID and we share that resource. Certainly the Centers for Disease Control and Prevention, as well as every one of our counties, really, has excellent data so they can see what's happening in their own county and access information resources within those websites. The vaccine question has been coming up a lot here in the last week. I try to explain to them that I don't have complete control as to who's going to get it and who isn't, but that given a disease such as PH, they will more than likely fall into the high-risk group and be in the front of the lines.

Dr Ryan: Great. Just one more question, and I'll cut to the chase with it: the issue of licenses. Mark, you have to cover a wide area. How do you handle this issue?

Dr Avdalovic: We try and discuss telehealth issues with our compliance office on a monthly basis. My perspective on this is, if I practice medicine on a consistent basis in a state in which I am not licensed, technically that state could claim that I am practicing medicine in their state without a license. For example, Oregon is a very strict state when it comes to this type of thing. I have many patients based in Oregon. How do I navigate this? What I usually say to the patient, who for whatever reason has decided to do their visit via telehealth from their Oregon residence, is to emphasize that it would be in their best interest to have a local physician who is familiar with PH. I offer them the website from the PHA for them to peruse in order to find a local resource for PH. But I recognize that sometimes, geographically, I am the closest PH doctor

to them and that good medicine comes first. If it's an established patient and they have either moved to Oregon or are living there as part of some pandemic response, we discuss that it would be ideal for them to be in California when we're having these visits; but then we go on and deal with their medical issues. I am very careful in my documentation that I've offered the patient a variety of different resources, and then we move on to the salient features of their clinical care.

Dr Ryan: Jennalyn, the last question I want to ask you goes back to our sickest patients. The initiation of parenteral prostacyclin always has been hard to do, always has been a tough discussion, and now we're purposely saying to our sickest patients that we need them to come into the hospital and do our most advanced testing. What are your thoughts on this and how has that changed?

Dr Mayeux: I don't think there's been one approach that we've taken with every patient. Once again, I'm very big on shared decision making. With our patients, we historically have always started our parenteral prostacyclins inpatient and we have initiated a subcutaneous patient at home, feeling out who is most responsible, but we really do want to limit the time in the hospital, maybe adapting to what unit a patient can go to in order to not have any overlap with COVID areas.

I don't think we have missed any new initiation on prostacyclins, but we have maybe delayed our patients who need to go from oral prostacyclin therapy to an intravenous or subcutaneous route. If something dramatically changes, we will make this happen as soon as possible, and that's mostly just been since we've undergone a surge lately and really have had bad issues in the last few weeks. Knowing that these patients know we're just a call away, we can always get them into the hospital, they'll always be a priority, but trying to manage their safety on both sides with PH as well as COVID risk.

Dr Avdalovic: I don't think that we've missed an opportunity to put a patient on parenteral therapy if we thought it was medically necessary. We do have a very large meth-using population. It's probably the largest meth-using population of any PH center in the United States, because we are in Northern California where meth got started. Parenteral therapy, intravenous therapy, is really not an option for the majority of those patients. We do test them very frequently for their tox status, but nevertheless I would be very careful about placing a catheter in a patient with recent meth activity who now has severe PH requiring parenteral therapy. We'll start them on subcutaneous if they're very severe. If they're mild, obviously we exhaust all of our oral options. If we've arrived at a point where we feel that a patient has the social support and capability to manage an intravenous approach and they are severe enough that they really will benefit from that, we have gone ahead regardless of the pandemic, and brought them in and gotten them started.

Dr Ryan: Yes, and think for the most part, as Jennalyn said, it's a shared decision-making discussion with patients and their support, ensuring they have the confidence in you and your team, to make sure that you're doing that as safely as possible.

For me, this has been a tremendous discussion with both of you. It has been so valuable to hear your insights and how you've adapted things so successfully amid the challenges you've faced. I know that you both have been working incredibly hard and putting on a lot of hats over these last 9 months, as care providers and as family members for your family outside of work, so there have been a lot of demands on your time. We do appreciate, on behalf of the editorial board of *Advances in Pulmonary Hypertension* and the PHA, both of you taking the time out of your schedules to be part of this today.