JEFF POTERUCHA: All right, well, let's kick this off, I'd like to welcome everybody. On behalf of the Mayo Clinic School of Continuous Professional Development, I'd like to welcome you to the Mayo Clinic COVID-19 Webinar Series. I'm Jeff Poterucha, senior education specialist and your host for today's webinar on Caring for Critically Ill Patients with COVID-19, Top Lessons and Innovations.

So just a few housekeeping items, this webinar is accredited by the AMA for one credit. There are no relevant disclosures for the discussions we're going to be having today. And of course, we'd like to thank Pfizer for their support of this educational activity.

Now if you are interested in claiming credit for today's webinar, a few points to go over. So first, you can see that there's a website you can visit to claim credit. That's ce.mayo.edu/covid0817.

So what you'd like to do is, after this webinar, you can go log in to the Mayo Clinic website. If you aren't registered, you'll have to register first. But using this HTML here, you can enter that code in the access code box.

And what will happen is it'll allow you to access the course, complete a short evaluation, and then you'll be able to download or save your certificate just like that. So COVID0817 is the access code for today. And of course, during the course of the webinar, we'll be offering reminders about this ability in the chat section.

So what you'll see at the bottom of your screen is there is a chat and a Q&A function. So for today's webinar, if you have any questions that come up during the discussion, you'll want to drop those questions into the Q&A box. Because that's what we'll be monitoring and our presenters will be monitoring to bring up for discussion today.

If you put them in the chat function, there's a chance we might not see those. So also about that Q&A box, is there's an upvote portion. So if you see a question that you agree with or you really want to hear answered, you can go ahead and upvote that question. And it's more likely that our presenters will notice that and bring it up into the topic of discussion.

Moving forward here. So today, for our learning objectives, before I turn it over to our moderator, what you'll be leaving with is the ability to review the common clinical manifestations and challenges in caring for critically ill patients with COVID-19, be able to discuss innovative solutions to these challenges that have been implemented across the Mayo Clinic enterprise, and then finally, you'll be able to identify the importance of interprofessional collaboration to successfully deliver effective critical care to COVID-19 patients across the health care system.

And so with that, I'll introduce our moderator, who is Dr. Alexander Niven. Dr. Niven is the education chair of the Division of Pulmonology, Critical Care, and Sleep Medicine at Mayo Clinic Rochester, as well as a critical care, independent, multi-specialty practice. He's a consultant within pulmonary and critical care medicine and an associate professor of medicine. And Dr. Niven, I'll hand it off to you here.

ALEXANDER NIVEN: Thanks, Jeff. Really appreciate the introduction, and it is a privilege and honor to be here today with the distinguished faculty members that have joined us. So it's my true pleasure to introduce the other faculty who will be participating in this webinar today.

So starting off with Dr. Anjum Khan, who is the chair of critical care in the Mayo Clinic Health System. She practices in Mankato and is an assistant professor of medicine here at Mayo Clinic.

Next, we have Jason Siegel, who is joining us from Mayo Clinic Florida. He is a senior associate consultant in neurocritical care and has really been one of the driving forces down there when it comes to our COVID-19 Treatment Review Board. And he will describe that in more detail today.

Next, it's my pleasure to introduce Dr. Devang Sanghavi, who is a senior associate consultant in critical care medicine at Mayo Clinic Florida and the director of the intensive care unit down there, the medical intensive care unit. He's an assistant professor of medicine.

And also, Alice Gallo de Moraes, who is a consultant here in Rochester in pulmonary critical care. She is the chair of our Medical Evaluation Response Committee and so is responsible for oversight of codes and rapid responses here in the facility, and is one of the many, many hats that she wears.

So I wanted to start with just a bit of an introduction for folks who are joining us for the first time to explain what we talk about when we describe the Mayo Clinic Enterprise, which is really our disseminated health care network that represents our Mayo Clinic health care system.

So I'm speaking to you from Mayo Clinic Rochester, sort of located in southeast Minnesota. And we have, really, three, now four, destination medical centers, if we include the one in the Middle East. But the three that the people commonly talk about is our center here in Rochester, our destination medical center in Scottsdale, Arizona, and then our third destination medical center in Jacksonville, Florida. Next slide, please.

Now, like many other systems, we have a disseminated health care network. And that network includes a wide variety of locals who are community-based and rural access hospitals, which we refer to as the Mayo Clinic Health System. So that includes, basically, a wide swath of area, including southern Minnesota and sections of Wisconsin and a little bit of Iowa.

And then we also have the Mayo Clinic Care Network, which is a wide variety of other hospitals and health care systems who have entered into, basically, a collaborative relationship with Mayo clinic to be able to access some of the resources and consultation services that we provide.

So with that, I'm going to move into, really, what we're here to talk about today, if you move to the next slide, Jeff, which is really managing and learning how to manage COVID-19 patients in this challenging health care environments that we have faced now for over six months.

And I think as providers-- and I spend a substantial portion of my clinical time in the intensive care unit-- one of the biggest struggles for me has been trying to synthesize the volumes of information that have come from, really, all points, both reputable and on social media, that have provided all sorts of different opinions in terms of the best way to manage COVID-19 patients.

And so we have spent a great deal of time and effort as critical care enterprise within Mayo Clinic, trying to synthesize and curate that information in the best ways possible to deliver clear, concise recommendations in terms of what we think at least that the best understanding is for different issues right now. And that's really our goal of this series of webinars that we're starting with today and that we will continue as a discussion a month from now.

I will just highlight the high points in summary of many of the protocols and efforts and things that we've been doing is summarized in a public website, the Ask Mayo Expert COVID Navigator, which is available through the link that you see on this slide. And really, what we have done with this is tapped into the wealth of expertise within our Mayo Critical Care community and also turned to members of the Kern Center for the Science of Health Care Delivery to help us to do focused scoping reviews to help inform many of our recommendations.

And really, the goal of this and other Mayo Continuing Professional Development products is to provide you with a little bit of the why behind these recommendations and focus take-home points that you can translate into your practice.

Another thing that I've spent a fair amount of time over the course of the last few months talking about is maintaining a culture of high performance, especially within our Critical Care community that has been under a great deal of stress, caring for COVID-19 patients during a climate of very rapid change. And so I just wanted to highlight another resource for any member who is on this call.

It's an app called the Mayo Clinic Well Being Index that can be accessed through the link that you have here that gives a brief tool that you can use to identify your level of stress, risk for burnout and errors. And if you are comfortable entering your institution and practice location, it also provides a series of sort of dedicated or local resources that you are available to access.

And with that, I'm going to turn to my next speaker. What we're going to do is we're going to give you our lessons in a rapid fire upfront and then save plenty of time for questions. So as issues or thoughts come up, please, again, put them in the QA box. And we will answer as many as we can during the time that we have allocated. So Jason, I'm going to pass it to you to talk about our COVID Treatment Review Panel and the system that you have been leading in Florida.

JASON SIEGEL: Thanks, Alex. Yeah, so I will kind of give a really high level overview of the way we've approached COVID and COVID treatment down in Florida. As we know, there's no cure for this disease. We're all just doing our best to digest all the information out there that we're learning or we think we're learning about the disease and its treatment.

And to undergo that kind of challenge, you need a lot of people invested and a lot of people involved. And we have a system that we've created that incorporates several of our research trials and our research department because a lot of what we offer are a part of research trials. And combine them with what's been reported in the literature as potential treatments, medications, strategies, and things like that.

And what I really want to highlight here is the multidisciplinary approach to it. And that top box represents the membership of our Mayo Clinic Florida COVID-19 Treatment Review Panel. And we meet three times a week. We have representation from Critical Care Medicine, Hospital Internal Medicine, Infectious Disease, Pulmonary Medicine, the Emergency Department, Community Internal Medicine, Hematology, Rheumatology.

We have an ethics expert. We have somebody from the blood bank. We have a pharmacist. Of course, we have members of our research team. And it really takes this kind of group, we found, to be able to understand the literature, understand the proposals, and to put forth what we think is the most reasonable approach for our patients, at least. You can go on to the next slide.

So this is what our treatment algorithm looks like. I'm not going to go through this in great detail. I'm happy to answer questions about it. I'm happy to go back to it. But a couple of the key points I want to address is that, in general, the heavy part of this algorithm is the left side. That's going to be our inpatient arm. This is a critical care webinar, so we'll stick to that.

We have a number of labs that we have recommended get drawn on admission and throughout the hospitalization. We've kind of put our patients into three groups. And roughly, we call mild, moderate, severe, though we try to avoid using those terminologies because if you look at different, again, articles, different research proposals, mild, moderate, and severe have different characteristics many times.

So we've kind of divided them into essentially minimal levels of oxygen need, a more moderate level of oxygen need, somebody who's on high flow nasal cannula even, and then the higher oxygen needs in patients who are mechanically ventilated, ECMO, or have other multi-organ system failure, shock, and things like that.

What I have here is the list of both treatments and research trials that we would offer to a patient in general in those boxes. And you'll see familiar things. You may have heard of convalescent plasma, remdesivir, and dexamethasone. And again, I can talk about how we address each of those specifically, if you'd like. We have some off-label medications on here, including anakinra and tocilizumab, and then, again, a number of trials that we're participating in as well.

This is a very living document. Again, this changes very-- not every day. The last change was made on August 12th. If we get a new trial, we'll add that on. If we find something new in the literature, we might make adjustments, things like that. So it's under consideration at every meeting, and is always prone to change.

I also note, point out a couple other things, that our panel focuses the pharmacological treatment of COVID. We have kind of side experts from hematology, pulmonology, who have also devised anti-coagulation algorithms and refractory hypoxia algorithms. Our panel is not so heavy in devising those algorithms. We do endorse them and say that we've reviewed them when we think that, yeah, those experts have created algorithms that would work for our center. And we would-- you'll see on this algorithm that they're highlighted as well. So we go into the next one.

In addition to the three times a week meetings of the treatment review panel, their next question is how do you translate that into practice? How do you take this algorithm and make sure that the various internists and hospital lists are aware of recommendation, the numerous critical care physicians and infectious disease doctors are aware of it.

And so, I'm not going to go through this algorithm in detail, but every day at 11 o'clock a member from the treatment review panel, the infectious disease team, the research coordinators, we meet with the hospitalists and the critical care doctors. And we go through all the COVID patients. We go through all the treatment plans, many drugs-- remdesivir, for example-- may have already been started, maybe not. And there's a question about whether this patient's a candidate for that, or dexamethasone, or what have you.

And so every day we go through [INAUDIBLE] for every patient, as well as screen them for potential trials. On the right side of the table, just four of our trials that we've been enrolling in-- we have a number of others, but these are four of them-- and the bottom line is that about a quarter of our patients who are hospitalized are enrolled in a trial, probably over 90%, depending on the trial, 90% to 95% of eligible patients are enrolled. So we're enrolling almost every single patient, which would meet criteria for a trial. And that ends up being about a quarter of our patients.

So we have found that these processes-- actually, it sounds like a lot of meetings, a lot of conferences, a lot of getting together and talking about-- but it really actually has smoothed out the process. There's less confusion. Everybody's on the same page. And we're able to really communicate what the review panel has reviewed to the bedside practitioners. And we've gotten very good feedback from that end.

So that's what I'll have right now. Again, I'm happy to answer any questions about that process, or any of our treatments later.

JEFF POTERUCHA: Thanks, Jason. If you can move to the next slide, Jeff. Alice, you want to take over and talk about what we've learn?

ALICE GALLO DE MORAES: Hi, thank you for having me. So we have to do some quick changing to the way we protected our frontline team that responds to rapid-- responds back to patients to code blues here at Mayo Clinic in Rochester. For that, with the help with our [INAUDIBLE] team, we considered all code blue activation-- that's high AGP-- just for the potential to have to do chest compressions, and everybody in the team should respond in full PPE.

We had to basically fit test about 100 people in a matter of, like, couple days to maybe a week. And what we changed also is that both the code nurse that comes from our cardiovascular unit, and our team nurses are now bringing extra, two extra sets each of PPE, so everybody in the team is very well protected.

We also added an oxygen hood to our RRT cart. And that is mainly for transportation to prevent aerosolization during transportation. Our ICUs mainly have closed unit codes. And what we did, initially our pharmacy colleagues, our pharmD colleagues were not fit tested for N95. So what we did, we created the mini ACLS kit, that is literally a little bag that the team leader takes into the COVID rooms, if a code happens in one of those COVID rooms. Just out of curiosity, this kit has three vials of epinephrine, two of bicarb, two of calcium, and one of amiodarone already premixed.

And another thing we did is we added a LUCAS device for in-house code blue. Historically, at Mayo Clinic in Rochester, we do not use LUCAS devices for in-patient code unless the patients are being transferred from the cardiovascular unit to the cath lab, or to an OR, or from the ED to the cath lab, or OR. And doing COVID surges, we introduced the LUCAS device for in-house code blue.

And with that, the education team for the medical emergency response subcommittee here in Rochester also had to train about 100, among nurses, respiratory therapists, and code team leaders on how to properly apply the LUCAS device, because as most of you know, a LUCAS device applied incorrectly can cause some serious damage.

And those were my updates. And I'm happy to talk more later about anything.

ALEXANDER NIVEN: Fantastic, thanks Alice. Anjum, I think you're up next.

ANJUM KHAN: Hi, so we did everything else that Florida does. We participated in trials. And we also, we are doing our best with collaboration with the Midwest ID team for our patients. But I felt that we are not meeting the needs of the families. These were not allowed to come and visit, which was very stressful. They were calling the ICU four or five times a day. And depending on who took the call, sometimes they promptly got, you know, different perceptions of different people about how their loved one was doing.

So that was really stressing them out. And it was causing a huge emotional burden on the families. Some of our patients didn't know it because they were intubated and sedated. But it was tough time.

So we came up with an idea. And we implemented it pretty quickly. We have access to all technology at Mayo Clinic. But we kept things simple, because if we were using advanced technology, then it would take forever. So what we did was to minimize crowding, we just had the provider team, were there, if they had any residents or EPPs with the respiratory therapists round on the patients early in the morning.

After that, we normally do interdisciplinary rounds at the set time, which is 9:30, during the usual care, prior to COVID times. So we had two phone lines. We [INAUDIBLE] up a script. And there's a reference in the second slide where the article is. The script should be available if anybody's interested in using it. We kept it very structured.

So the charge nurse would call a pre-designated family member. And on a separate line, the whole interdisciplinary team would call in, which included our pharmacists, our dietitian, physical therapist, everybody would call in on a separate line. And we had a second phone line for the family. So we assigned family member. We would use the script, would say, it's time for doing rounds. And are you ready to join? And other family members wanted to join, they would join on that phone.

So the nurse would do the summary of overnight events. So the family member heard everything that happened overnight. And then she would also do the ICU checklist, as we would do it for any other ICU patient. Then the charge nurse would call out to each team member to fill in about the medications, the physical therapy plans, the weaning plans. All these would be discussed while the family was still on the line and hearing that their loved ones were being taken care of, and good care.

We would talk about the PT plan. So it's a COVID patient, that doesn't mean he doesn't get physical therapy. We talk about patient is still going to get out of the bed, and perhaps take a couple of steps in the room.

So after doing this, in the end, the physician which summarize key points for the day, like what are we going to do. And if there were families-- a few of our patients were non-English speaking because of exposure in a couple of meat plants in our area. So we had a interpreter available to communicate. And that would be the other member of our team at that time. We used the interpreter services for this.

And then, as a shared, provider would summarize. And the families were very grateful. And we continue to do that. We've been doing this for three months now. And I think we have tried to take care of the family members, as well, with this system.

ALEXANDER NIVEN: Thanks, Anjum. I think, keep on advancing, Jeff. And Anjum, if you don't mind, just closing your microphone. And we'll switch over to Devang.

DEVANG SANGHAVI: Hey, good afternoon, everyone. Thanks for inviting me. So at Mayo Clinic Florida campus, as Jason was mentioning, we did several of the innovations to help our COVID patients. And you can go to the next slide, Jeff, please.

One of the things that we were kind of worried about-- and Alice kind of mentioned in her presentation-- is risk of aerosols and aerosol-generating procedures, especially during codes and rapid response on these COVID patients.

But so we were worried about it. And we kind of wanted to like identify those patients who were at risk of decompensating quickly, and have a process in place, wherein we could provide that just in time care to them and bring them to the ICU, and if need be, do those aerosolizing procedures, such as intubation, bronchoscopy, in a more controlled environment.

So we started going about doing this remote monitoring of these COVID patients. And I'll talk about that a little bit. But Jeff, you can move to the next slide. What I wanted to share was, as all of you might have experienced this, this specific challenge of COVID with lack of family visitation, a lot of consulting service, and the risk of exposure.

So there were wide [INAUDIBLE] of, like, technologies available at disposal. So we kind of utilized and streamlined it, in terms of how we would approach each specific challenge, so right from using, like, a robot, or a car. In the top screen, you'll see more consults in the ED or elsewhere, through the iPad or any other tablet device, for remote monitoring-- that I would mention a little bit later-- or using FaceTime, as simple as that, for families to communicate with their patients and kind of risk stratifiying based on how much option they were on, and whether they were at risk of aerosolizing, whether they were on BiPAP, intubated, and so on and so forth. So next slide, please.

So the key innovation I wanted to talk about was the remote monitoring process. And in March, we kind of started seeing our first patients with COVID-19. And we realized that more patients needed general level of care, or PC level of care than IC level of care. And the ICU team was available to help our PC patients. But the hospitalist team faced a resource crunch. And that's when we realized that ICU team can help the floor team in identifying those patients who were at high risk. And we had all these technology that we described, be it tablet and other things.

So our APP team was crucial in devising this remote monitoring plan, wherein you would twice a day do intentional rounding using technology, charts, rounding, monitoring, [INAUDIBLE] science, observe requirements needs, and seeing if patients needed escalation of care, and then utilizing our rapid response nurses and ICU team, bring them to the ICU if need be, just in time so that we could prevent those catastrophe, like a code blue or a rapid response.

In the first six months, six weeks that this, our APPs did this remote monitoring, we were able to avoid code blues, rapid response. And we were been able to bring 12 patients to the ICU through this team and intubate them in a negative pressure room in a more controlled environment.

But as we faced [INAUDIBLE], come June, we started seeing more patients. And the volume of these patients was more than what our local team at Mayo Clinic Florida could provide service to. And that's when we reached out to Mayo Clinic Rochester, the ICU team there, who had the bandwidth and the expertise to help us.

They kind of picked up the same process, same work flow, and helped us do the same kind of monitoring, rounding twice a day on these patients, redefining what characteristics they would follow, and kind of implement our, the SOP, or the treatment that is, like, discuss with the treatment review panel in the morning, so follow through with the algorithm and approach, and kind of, like, be that safety net for these patients. Because we know that a lot of these patients seem normal, or doing OK. And then they be compensated, requiring increased option requirements, intubation, or maybe hemodynamic instability.

So this collaboration was very crucial. And the seamless nature of this, from Mayo Clinic Florida to the Mayo Clinic Rochester, was as smooth as it can be, and can potentially be implemented elsewhere. And next slide, please.

So this kind of ties up with our overall enterprise vision of 2030, where critical care and telemedicine becomes, like, paired together with, be it ICU without boundaries, E-ICU, utilizing our rapid response nurses, robots, and other technology, and implementing some of the machine learning and AI to identify these at-risk patients, and bringing them the required care in time. With that, I'll pause and then take questions during the question answer section. Thank you.

ALEXANDER NIVEN: Fantastic, Devang, thank you very much. I think if we want to advance to the next slide, oh, did you want to just acknowledge the team that you had here?

DEVANG SANGHAVI: Yeah, so these are some of my-- I couldn't put all of the names. But these were some of the leaders and all the team members from Rochester and Mayo Clinic Florida, who were part of this team who would make this happen. Thank you.

ALEXANDER NIVEN: So we've got a lot of questions. And I think in the interest of flowing through, let's just talk a little bit about one of the questions that came through the Slido feed prior to this session, which was asking about the feasibility of proning patients who are not intubated-- so individuals who are, for example, still on non-invasive ventilation.

And Anjum, could you perhaps start talking about this? And we can open it up to the group. And for everybody who's in the question and answer session, I'm tracking those questions. So we will address those momentarily.

ANJUM KHAN: So with our local experience, we had about 66 school board admissions to the hospital. And 15 of them required ICU level of care. Out of those 15, 12 required mechanical ventilation. Out of the 12 ventilated patients, we did try a high-flow nasal cannula and CPAP on eight of them before they got intubated.

We proned people with high-flow nasal cannula and Oxymizer. However, we did not prone anybody with CPAP because we were worried about aspiration. But I just realized that we have a couple of articles, one from Lancet, that was published a few days back. The reference is here. They had about 47 patients. And these are patients which are not on mechanical ventilation, so it's CPAP and oxygen. And they did prone out those 47. And they saw that a 50% PaO2 significantly improved in 57, in 50% of the patients.

However 12% of the patients-- 12 patients got intubated, which is about 28% patients. And half of the intubated patients were from the early proning. And they proned these patients only for three hours. So the only difference really was that the PaO2 improved.

And I know that there is a smaller study from New York by Dr Ding, which had proning of CPAP patients. And they had about 20 patients. But in their study, also, 12 of those patients did get intubated.

So it does help the oxygenation. But I'm not sure that it prevents people from getting intubated. I think the low tidal volume ventilation is probably what we should be doing, early neuromuscular blocker. But if we don't have the resources, it may be the right thing to do.

ALEXANDER NIVEN: Yeah, this has been a hot topic, and a very controversial one ever since, really, the practice started emerging in critical care conversations across the world. And so I guess I'll open it up to other members of the enterprise panel represented here, just to add any additional comments before we move on to the next question and topic.

DEVANG SANGHAVI: Well, I completely agree with Dr Khan, the fact that we do use proning as a method, in spite of the hypoxemia protocol that Jason Siegel was talking about. And our remote monitoring team, and even the E-ICU team kind of encourages patient, because these patients are not intubated, non-ICU patients, who are motivated to be proned, because at tummy-time, if you like that. So, but it improves oxygenation, for sure, in some of those patients. But I don't know whether it prevents intubation, as Dr Khan mentioned.

ALICE GALLO DE MORAES: I just want to make a quick comment if that's OK, Dr Niven. I completely agree with Devang and Dr Khan. Another struggle that I personally have is we have very good protocols for intubated proning, in terms of ideal timing. We have several studies comparing shorter and longer tummy-time time. And we don't have that yet on non-invasive prone position.

So what we do now is maybe two to three hours proning, and then see if patients improve. But we don't know the ideal timing of each session of proning that would actually work. And I believe there is a very large multi-center trial going on. And I believe the PI is Dr Simpson from [INAUDIBLE]. I don't remember where he works right now, which is not good. But--

ALEXANDER NIVEN: University of Kansas.

ALICE GALLO DE MORAES: There you go, University of Kansas, thank you. But I think that some of the answers that remain un-- some of the questions that remain unanswered regarding tummy-time without a tube in.

ALEXANDER NIVEN: I can't do any better than tummy-time without a tube in. So with that, I'm going to move on to, I want to turn to you, Jason, because there's lots of questions here with regards to different therapeutic interventions. And actually the top thing on the feed is talking about potential roles of adjunctive therapy with vitamin C, zinc, vitamin D, vitamin A. And then there's also questions about when to use a second unit of convalescent plasma. Maybe I could turn, or start with those for you.

JASON SIEGEL: Yeah, I was, yeah, I saw those in the Q and A's. So to be to be frank, we've looked at the multiple vitamins. We have not been giving doses, high doses of vitamin D, vitamin C, vitamin A, zinc-- we-- especially in the ICU. Could there be a role for these types of things in patients, especially on the, maybe the outpatient setting? Perhaps. But once they become hospitalized and come in the ICU, we have not been actively recommending.

Now, could a provider at a hospital say, well, I'm going to go off-script and I'm going to start giving my patients zinc and vitamin C and everything? Yeah, I mean, there's nothing we're doing that would actively stop them from doing that. We want to make sure that the providers still have their degree of autonomy. Many of them have also reviewed the literature, and looked in those things. And they have not been compelled to, again, go off-script and then start prescribing vitamins in that way.

In terms of the convalescent plasma, I think what we're learning is that it's safe, and that the sooner you give it, the better it is. And Dr Joyner and I are investigators-- I think, I prereleased this past week, maybe was late last week-- showing that there was a potential mortality benefit of the convalescent plasma. Again, this isn't the final peer-reviewed article yet.

So our practice has been, as a recently, give it to them quickly, and give them the second unit quickly. If it's safe, and the sooner we get it, the better, then we want to give them two, if it's available.

Let's see, the process of convalescent plasma, I think, well I know at least at our center, and at many centers across the country has gone a lot smoother, as is we've been doing this for a few months, which is good as well, a lot more available, a lot more availability. I think a lot of people in the community are a lot more aware of it, a lot more donors. And that these are good things.

Starting out, we actually we're not able to house it in-house. We had to get it from our local blood donor. Now we have it available at our site, which makes the administration much easier. So let's see, I think that's when I got on convalescent plasma.

ALEXANDER NIVEN: And there are many, many more questions about treatment pouring in. But I'm going to jump around a little bit, in terms of the questions and the conversation.

JASON SIEGEL: Yeah, yeah.

ALEXANDER NIVEN: So there's been a little bit of conversation in the chat box, in terms of safety and efficacy for high flow nasal cannula, as well as the proning with or without PAP that we were talking about before. Devang, could I ask you to comment a little bit on that?

DEVANG SANGHAVI: Sure, so you know, like the person who asked the question about high flow nasal cannula early on in March, April, it was certainly a concern, especially at a higher flow, with high flow nasal cannula, that there may be a risk for aerosolization. So with that, early on in March, April, our practice was to not [INAUDIBLE] the high-flow flow past 20 liters.

But as we got more understanding of this virus and more research articles came out, one from Michigan-- and we also conducted our own enterprise-level aerosol testing, and seeing what amount of aerosols generated with different delivery device-- we started getting more comfortable that maybe there is not as much risk of aerosolization.

But nonetheless, there is some. And we kind of encourage our patients now who wear a mask, if feasible, if they can tolerate, when they are on high flow nasal cannula. But we have not restricted the flow any more to 20 liters. We're going as high as 60 liters, and 100% FiO2, if we have to, with the high flow nasal cannula.

And as I mentioned, like, as far as our infection risk of people from providers and nursing side, getting the disease or contracting, in hospital, disease rate has been, as far as we know, zero, at Mayo Clinic Florida campus. We have been using high flow, BiPAP, oxygen hood, and other oxygen delivery devices. And it has been safely used with the precautions that we take. Thank you.

ALEXANDER NIVEN: Other thoughts or comments from the panel?

ANJUM KHAN: We managed a patient on high flow, 60 liters, for about 10 days. And he did, he was getting better. He was then weaned down to five liters, unfortunately, developed a hospital-acquired pneumonia, and got intubated for that. Remained intubated, though he had fibrotic ARDS setting in, intubated for two, three days. We moved him out to the floor after extubating him. And then he came back to the ICU, again on high flow for a few days, and was discharged home. But unfortunately, severe pulmonary fibrosis, he went home on two or three liters of oxygen.

But we did use high flow for almost 10 days for him. He was younger, and not many other comorbidities.

ALEXANDER NIVEN: Yeah, I guess maybe I'll insert my own editorial comment there. Because I really struggle with this practice, in this area. I think that, as, I think, Alice had mentioned before, we have a really good protocol, in terms of early intubation-- actually, it was Anjum. You mentioned this before-- in terms of early intubation, lung protective ventilation, and lung rest strategies, that have been very effective for us in many, many different, well, ARDS, for many, many different sources.

And I think early on in the pandemic there was a lot of concern about the infection risk associated with intubation, and how much of that drove these practices of continuing people in high flow nasal cannula, and PAP therapy for a longer period of time. Some of it may have just been ventilator availability as well.

But I struggle with the potential risk of sort of patient-induced, or PSILI, so patient self-induced lung injury, and the potential subsequent risk of pulmonary fibrosis. We just don't know how much of the pulmonary fibrosis we're seeing is due to a wicked bad virus and bad lung inflammation, and how much of it is because of the variation in our practice. So I guess I'll just add that as an editorial comment and something that I really still struggle with in my own personal practice.

So while you brought up the topic of pulmonary fibrosis, there was a question that had come in from Slido, prior to our session about this, and what to do with ICU survivors who are left with lung fibrosis, which I think many people are seeing. Alice, could I maybe have you take that question to start off with?

ALICE GALLO DE MORAES: Yes, so in our PICS clinic, we are starting to see COVID survivors. And again, I just, I always like to make this comment every time I'm in the webinar about COVID. Our first case was just described, or confirmed in December of 2019. So for formal pulmonary fibrosis, we haven't had time yet to see what these patients are going to be left with.

What we know from infections, ARDS, and pulmonary fibrosis, is in about six to 12 months, we have what is going to be their final pulmonary fibrosis. And what we're seeing actually in our PICS clinic is that the patients are coming back after three, four months. Their fibrosis has been improving, compared to what we saw from when they left. So probably a lot of more inflammation when they left the hospital that improved by the time we see them three, four months afterwards.

I did see in the Q and A box about pirfenidone. I think pirfenidone is a super-promising drug for prevention of worsening of pulmonary fibrosis. We know from idiopathic pulmonary fibrosis, we know from connective tissue disease related pulmonary fibrosis. So I don't believe we won't be able to extrapolate to COVID-related pulmonary fibrosis, if it comes to that. But I don't think we have had enough time and enough patients that we've seen in clinic that we could say for sure, or for sure not anti-fibrotics for this patient.

Main thing is, like Dr Khan said, make sure they go to pulmonary rehab early. If they need oxygen going home, make sure to send them on oxygen at home. When you see them back in your PICS clinic or in your pulmonary clinic, make sure that you also do an overnight oximetry because it might be that they are hypoxic at night now, and that certainly contributes to a long-term pulmonary disease.

Sorry, like very winded, but that's all we know for now.

ALEXANDER NIVEN: Anjum, the question that's risen to the top of the list right now is asking about your family-centered rounding strategy, and how long patient rounds take with the family engagement approach that you have.

ANJUM KHAN: So it should, we try to, because of the script-- and the script is available with the article, but it's still in press. It hasn't been published yet-- because the script is very structured, it shouldn't take more than six minutes because we call out each team member. Like, after the nurse does her overnight events and ICU checklist, so the charge nurse will say, pharmacist, and dietitian. They go in order. So it doesn't take so long. But it has been as long as 10 minutes, so 6 to 10 minutes.

Usually we have-- our census is 10 or 11 patients. And it takes them about 10 minutes, 6 to 10 minutes per patient. So not too long, but the value, you can't imagine how grateful the families are, because they have not been allowed to visit.

We didn't even have like you guys, we had like no visitor policy for months. And with COVID patients, we still have no visitor policy. So it's a huge thing.

ALEXANDER NIVEN: And Anjum, do you set clear expectations with family members upfront, before they engage in your rounding format?

ANJUM KHAN: Yeah.

ALEXANDER NIVEN: And how do you manage that?

ANJUM KHAN: So it's a part of the script. So the charge nurse would say that if you still have questions, the provider will call you after rounds. And if the family starts asking too many questions, he'll say, we'll call you back after rounds. Because we do touch base with families at least twice a day. So we'll give them a call if they still have questions.

But this was more for them to see that their loved one is being well cared for, so give them confidence that even though it's a bad situation, we're still doing our best.

ALEXANDER NIVEN: Yeah, Alice?

ALICE GALLO DE MORAES: It would be OK if I asked Dr Khan a question?

ALEXANDER NIVEN: Yeah.

ALICE GALLO DE MORAES: Dr Khan, don't you feel also that having like this engagement help with non-English speakers understand what we're talking about when we talk about the tubes, and the drains, and things like that. We had a lot of Spanish-speaking patients. And I've noticed that it was easier for me to explain to them like showing what the tubes look like, and what we're talking about.

ANJUM KHAN: Yeah, we could have resorted to any kind of fancy technology. But we do video chat with the fam-- the nurse does video chat with the family member. Even if the family member cannot communicate, we still do that piece. But this was more for the interdisc-- because when with COVID, we were also stressed to have the whole interdisciplinary team weigh in, and the pharmacist telling me that this gentleman developed to DVT. I know this is one of the questions, despite being on therapeutic anti-coagulation. So those decisions to be made in the real time, with our nurse practitioner is on the computer. She's changing orders. It really helped to coordinate care very well.

ALEXANDER NIVEN: Thanks, great comments there. Jason, I think back to you, because treatment questions are back at the top of the chat box. So there's a very detailed question with regards to prioritization of remdesivir, and how to use that in your clinical practice, or in your treatment algorithm. And then there's several questions about use of hydroxychloroquine for prophylaxis, continuation of hydroxychloroquine and azithromycin in patients who are on these medications as an outpatient, and then decompensate and are admitted, and the role of inhaled steroids.

JASON SIEGEL: Yeah, excellent. So starting with remdesivir, we've had, our panels had many conversations around remdesivir for multiple reasons. Some of the main issues are, who to give it to. So the FDA is, emergency use authorization, says that a patient who is equal to or less than 94% SpO2 on room air, or as requiring supplemental oxygen, or is mechanically ventilated, or is on ECMO, should qualify for remdesivir.

Now when remdesivir is tested, it appears that patients who are mechanical ventilation, or in ECMO, don't benefit from it. And I think that intuitively for all of us, that makes sense, that the anti-viral probably would be more effective earlier on in the disease, as opposed to a later stage, which you might be having this, quote unquote, cytokine storm, or cytokine release syndrome. And maybe that's the driver of the deterioration, rather than the viral part itself.

So the other big caveat is, each, so remdesivir is currently allocated to hospitals based on state departments of health. Now the government has changed it a bit. And then now we can transfer remdesivir across state lines, which has loosened things up a little bit. But we still get all of our remdesivir essentially allocated through the Florida Department of Health.

And different departments of health have different qualifications. So Florida uses the FDA qualifications that I just mentioned. But the states of Arizona and Minnesota use slightly different qualifications for who should get remdesivir. So I think it's also really important to know what your state, how your state is allocating it to the hospitals. That's a major piece.

So what we do, in general, is that if a patient is or is at 94% or less on room air, or on supplemental oxygen, up until mechanical ventilation, then we would prescribe the remdesivir. And we would prescribe a five-day course. We remove that from our stockpile, from our supply, I should say. And that patient gets a full five-day course. We don't go day-to-day. If a patient gets a course, they get the full five days, if that's available.

But then we get into the next big thing, is the availability of remdesivir. Our hospital did actually have a period of time where we did not have any. We were waiting for the next allocation from the state. We had about five patients who did not get remdesivir. Thankfully they did well without it.

But then again, the question is, if you have more patients who need it than you have patients in the-- or than you have supply, what you do? So this is where our ethics team really was very helpful. And in general, what we've done is we do have a prioritization of patients, based on stage, stage of the disease course. Again, prioritizing to earlier, lower levels of oxygen need, earlier in the course, earlier from symptom onset, prioritize over patients who are further along, and not, again, considering really patients who are already ventilated or are on ECMO.

In terms of things like age, previous disability, even patients with dementia, the way we've been practicing is that if we have the doses, and the patient qualifies, we give it to them. Our practice does not withhold medicine from somebody who's very old because somebody younger might come through the door tomorrow.

Now, if we are in a situation where we are, we have less of a supply than we have the demand, then we do factor in overall prognosis into the prioritization. So it gets tricky again, for a couple of different reasons. What are the qualifications for it? And do you have enough of it? But that's how we've approached the remdesivir problem. I think, hope that answers that question.

The inhaled steroids versus the systemic steroids, ARrest Pneumonia is an ongoing trial. It was actually started prior to the whole COVID pandemic. But it's trying to answer that question in patients with pneumonia, do inhaled corticosteroids improve outcomes? That was a protocol that was modified, that allowed COVID patients to be in it. So that question hopefully will be answered here sometime in the near future.

We currently do not give inhaled corticosteroids as a routine part of the practice. We do the dexamethasone, based on the recovery trial out of England. And I think a big important caveat, or important point to that study-- and I typed it to at least a couple of the comments, or the questions-- is that what the recovery trial showed is that patients who are on supplemental oxygen, including mechanical ventilation, in ECMO, they had a survival benefit, more so than the patients who were ventilated.

And again, I think, intuitively, that makes sense, that the steroids, the later stages are going to be more cytokine driven, and inflammation driven, that maybe the steroids will be more helpful in those patients who are further in the disease and already, and are ventilated.

It did show a signal of potential harm in patients who were not on supplemental oxygen. So for that reason, if a patient is saturating well on room air, we are not recommending dexamethasone. Similarly, for outpatients, patients who maybe come to the emergency room and get discharged on room air, maybe patients in the clinic, if they are oxygenating, I think, over 94% on room air, we're recommending that dexamethasone is not administered to those patients.

I think the last part was hydroxychloroquine, which is always a fun one to talk about, and as always, always comes up in these kinds of webinars. We were giving hydroxychloroquine very early in the course of all this, way back in March. What I tell people, I remind them that in those days, every patient who passed away at our hospital was on hydroxychloroquine, and had been on since they were admitted to our hospital.

So we know it's not a cure. Is there a role for some patients, as outpatients? Well, so far the studies haven't really bore that out. So our practitioners, both on the outpatient side or the inpatient side, we have not been recommending the hydroxychloroquine. If somebody comes in on it, we don't continue it, just based on the best evidence we have. We don't think it's been shown to have been helpful.

So I think that hits all those boxes. Were those the questions?

ALEXANDER NIVEN: Yeah, no, that's fantastic, Jason. And we only have a couple of more minutes. And so I guess there's the last questions here, talking about management of cytokine storm, and also anti-coagulation issues. And I think, maybe I'll just address anti-coagulation issues real quick in the interest of time, and then pass it back to you for the different immunomodulatory agents that are out there.

I think that we have approached anti-coagulation, both for prophylaxis and treatment a little bit differently, in different areas of the enterprise. There is a pretty succinct summary, in terms of a recommended approach to anti-coagulation prophylaxis, or venous thromboembolism prophylaxis that's available in the AskMayoExpert COVID navigator.

I think the challenges that we have faced is how aggressive to pursue surveillance, whether or not to preemptively anti-coagulate individuals who don't have documented clot, and then what to do when there's evidence of a treatment failure. And with that, I'll pass that over to you, Jason, because I know you spent some time in that space as well. You have about three minutes to talk about that, and cytokine storm. Too easy, right?

JASON SIEGEL: All right, so with the anti-coagulation piece, our algorithm, I'll say at one point, it was heavily based on lab biomarkers, specifically D-dimer, and to lesser extent fibrinogen and intakes. And really, the key thing is that at one point, we had recommended that if a D-dimer was over 3,000 nanograms per milliliter, I believe, we recommended therapeutic anti-coagulation at that point.

Again, all of this is being studied. We try to do everything based on best evidence. Well, there seems to be pretty good evidence out now that even in ICU patients, early anti-coagulation without evidence of a venous thromboembolism, a DVT of PE, probably isn't helpful.

So we've since changed the algorithm, so that if somebody has a D-dimer that high, excuse me, that we recommend screening for DVTs, or PEs, if otherwise indicated, and then anti-coagulating if the venous thromboembolism is found.

Now, that all being said, we use a lot of TEGs at our hospital. We have for a while. There is a thought that maybe D-dimer isn't the best biomarker. Maybe a TEG is a better biomarker. These are things that we're still kind of working through. TEGs have been studied. We're doing kind of our own investigations. Actually, Dr Sanghavi is heavily involved in that as well.

So may that recommendation change in the future, where there is a biomarker to follow that we would recommend fully anti-coagulating, there could be. But right now, that's where we stand.

In terms of the cytokine release syndrome, we recommend on admission, getting IL-6s, getting CRP, and daily CRPs, getting ferritin on admission, I think every other day. We get D-dimers, I think, daily. And then IL-6s, what we say, if indicated, if a patient's getting worse, their oxygenation is worse, and there's other signs like fever, tachycardia, other signs of the cytokine release, then get an IL-6 at that point.

And for us, we don't have an absolute cutoffs, say an IL-6 of X means that person should get tocilizumab, or a ferritin of y means they should get anakinra, or things like that. We look at trends. And we look at the course. So certainly, many times patients' inflammatory markers had worsened. But their clinical state was improving. And we would say, don't escalate, just let the patient get better.

The two off-label medicines that we're using are anakinra and tocilizumab. Anakinra, because of a large French retrospective study. It was very retrospective, but had a very impressive P values. And in tocilizumab, and in general our practice is, especially if a patient isn't enrolled in any of our trials, they start with anakinra. And if they're worsen, then we try tocilizumab, up to doses, I think, 8 mgs per kg. So that's, in general, how we've been approaching those two issues.

ALEXANDER NIVEN: Well thanks so much, Jason. And I think we're a little bit over time. And I think out of respect for panelists, and also our attendees' time, we will bring this conversation to a close. I want to thank our faculty for really just an outstanding conversation. I learn something new every single time I listen to these guys, and so feel very fortunate to have the time to chat with them today.

Thank you very much for everybody who has attended. I recognize that there are a number of still open questions. And we will do our best to address these again. Most of this information is contained within the AskMayoExpert COVID navigator, under the link that we provided earlier in this webinar. And we will continue this discussion in about a month from now.

And thank you very much, Jeff. Do you want to just highlight our next webinar?

JEFF POTERUCHA: Yes, absolutely. So plenty of questions that we saw today, which will be continued in this conversation on September 21st. So much like the webinar today, if you're interested in continuing this conversation with our experts here at Mayo Clinic, you can visit at ce.mayo.edu/covid19webinar for those details and to go ahead and get yourself registration spot.

Now for the final housekeeping, is if you are interested in claiming credit, as we mentioned, there's an access code that you'll want to use. Once you go to the Mayo Clinic website, ce.mayo.edu/covid0817. If this is your first time with the Mayo Clinic webinar, you'll need to go ahead and get registered. But then once you're all signed in, you go to that link. And you can type in that access code, go ahead and start the process, to claim credit, to complete a short evaluation, and be on your way.

So again, we'd like to thank you all for joining us today. Look forward to having you with us next month, September 21st for the continued conversations about COVID-19. You all have a great day.