COVID-19 Engineering Response

Expert Panelists:

- John Criscione, Vice Dean, EnMed; Professor, Biomedical Engineering
- Michael Moreno, Director of Innovation, EnMed; Assistant Professor, Mechanical Engineering
- Saurabh Biswas, Interim Director, TEES Commercialization and Entrepreneurship; Associate Professor of Practice, Biomedical Engineering

Moderators:

- Joe Elabd, Associate Dean for Research, Engineering; Joe M. Nesbitt Professor, Chemical Engineering
- Sunay Palsole, Assistant Vice Chancellor for Engineering Remote Education

Video Transcript

Joe Elabd: Okay, I'm really excited to see everybody. We're having many more joining here. I am recording this session, also doing closed captions. I think you'll be happy with all that Sunay.

But, welcome to our COVID-19 Engineering Response Zoom panel.

Couple of things we'll cover in this one, we have three expert panelists here, which will talk about experiences about taking ideas that we have going on in the laboratories here at Texas A&M and taking it all the way to the hospital, which is exciting. We have a lot of exciting stories lately.

And also, the process in which that happens, which includes, from the very early design phases to developing prototypes, to having physicians look at them, to then handling issues such as intellectual property, FDA regulations, and liability and legal issues.

So, I'm really excited about this panel. We've had a lot of things happen, as you've probably noticed recent news. There're a lot of universities who have been involved with the possible idea of giving supplies or medical devices or equipment and developing prototypes and trying to meet the needs of a lot of area hospitals. And, of course, similar to other universities, we've

had a lot of hospitals, both in the area and Houston, reach out to Texas A&M Engineering to see if we can provide solutions for them.

So, kind of a pretty exciting time. Intense. It's rapid. So, I will first hand this over. I'm going to allow each panelist to introduce themselves. Talk a little bit about their experiences over the past two to three weeks as it relates to COVID-19 and our engineering response.

I'll probably ask a couple of questions, but as we go along, please feel free to use the chatbox to put some questions in there. And then, Sunay and I will kind of work together here, too, to ask the questions to the panelists when we go to the Q&A session.

Also, I'll be putting some things in the chatbox too that may be useful resources for you, such as if you do have ideas yourself, or you know other people that have ideas, whether they're faculty, staff, students, external parties, or hospitals.

We have set up a webpage where you can submit ideas through an RFID mechanism, and we are evaluating these daily. So, I'll try to put in some information as we go along in the chatbox for you as well.

So, our expert panelists today are John Criscione. He's Vice Dean of the EnMed program. As you may know, that's a program in Houston that combines engineering and medicine, and we teach students that are engineers in medical school. And also, this idea of innovation, which is really exciting. I think we're going through a time now where we're seeing EnMed in practice, I think, as it was meant to be. He's also a professor in Biomedical Engineering.

Also on the panel is Michael Moreno. He's the Director of Innovation for the EnMed program, and he's an Assistant Professor in Mechanical Engineering here.

And also, Saurabh Biswas, he's the interim director of TEES Commercialization and Entrepreneurship, and he's also Associate Professor of Practice in Biomedical Engineering.

So, with that, I'm going to hand this off to John Criscione, our first panelist, and then we'll go down all three panelists. Again, they'll give a little bit of background, talk about some of their experiences, and then we'll move to the Q&A session. So, John, please take over.

John Criscione: Thank you, Joe, and thanks for organizing it. If you don't know, Joe is organizing the engineering response to COVID, so he's going to be an excellent point of contact for you. And hopefully, you can quickly get it into the right groups and such.

I think we do need a lot of help, so, this is, I think, just a start, right, Joe?

Joe: [gives thumbs up]

John: [laughs] Yeah, because there's a lot of needs out there, and I guess I got started with the mass project looking at the respirators. That's pretty much all I've done; probably going to shift some work more towards ventilators.

But the beginning of last week, I guess about ten days ago, the Health Science Center wanted some help with developing alternatives to the N95. They're looking at their supplies, and they're looking at their usage and a lot of mismatch in that.

So, they wanted to consider alternatives on what would happen in a crisis situation, and JM has come up with some guidelines, too, for clinicians to follow.

So, they wanted an engineering assessment, sort of what was out there, and wanted to just make better decisions with data. Honestly, I think that's where we at the university could help the most, is unburdening some of their risks.

So, in a normal time, we would just say, "Use at your own risk." And it's tempting to just say that now, but we can say, well, "Use at your own risk, but we're going to give you some data. We're going to give you some evaluation. And we're going to take a look at it first, and give you some opinions." And yeah, we're kind of putting our necks out there somewhat on that, but I think the alternative is the people taking all the risk, then assume all the risk. So, I think it's part of what we can do with testing data and such.

So, we've been looking at different designs, 3D printed mass do-it-yourself (DIY) designs, and assessing them in terms of their filtering ability, and particularly how they fit. Do they pass the qualitative fit test, the quantitative fit test, and such?

And then, releasing the data, we just did an open-source [share] on the web just because that's kind of what's needed at this time rather than going through journals and such.

That's pretty much all I've done. And it's, based on the response I've gotten by most via email as well as the new stuff, it's probably the most impactful work I've done in my 20-year career, just within a week.

Joe: John is being a little modest. If you Google the news right now, you can probably see John in every outlet, including The Dallas Morning News. And so, all kinds of venues picked up by KBTX, and all the other TV stations and news outlets.

Participant 1: He was in ASEE this morning.

Joe: That's correct; he was. I saw that, yeah. So, good for you. I'll hand it over now to our next panelist, Dr. Michael Moreno.

Michael: So, I'll just use John's work to kind of segue. So, with respect to the masks, we've been interested in some of the 3D printer designs, but in particular, can we do this with autoclavable materials, and then use the disposable filters? There's a number of benefits of potentially being able to do that.

The other thing is that we've been really interested in is the filter efficiency. So, I've been doing some of the coordinating, if I will, with Sarah Brooks.

She does Atmospheric Sciences is where she's located, but she's doing some of the filtering testing now on a number of different materials that you'll see on some of these videos that are posted online where people are trying to develop these do-it-yourself masks.

And so, as John said, I think that's one of the really important things that we're bringing to the table, is kind of bringing some of the science, the fit testing he's doing, and into these do-it-yourself masks. I'm also the web developer for EnMed, so we've created this forum where other people can post, whether it's a scientific journal article or their video. So, we've had some people in response to John's, reach out to us, whether it's a hospital or another university saying, "Hey, here's our design. Here's what we found." And kind of vetting these a little bit, and posting some of those videos as well.

The other thing I've been involved with and most of the other work has been through a direct kind of contact with the clinicians down at Houston Methodist. And so, it's interesting because this was mentioned in passing in a conversation I was in that they didn't have any of these spacers or diffusers for inhalers. And the reason why this was important is that normally they would treat their patients that have respiratory ailments, and we're talking about potential COVID patients here, with nebulizers, but if you do that, you run the risk of aerosolizing the virus. So, they don't want to do that. They want to use these meter dose inhalers, but to do that efficiently, you really need these spacers, and they'd run out of them. So we came up with a 3D-printed design for these spacers. We looked into this a little bit more, and so we have the complete 3D-printed design.

We also came up with the design, almost like the do-it-yourself mask. We found that we could potentially use a water bottle and just create a fixture that connects the water bottle to the inhaler. And now, in a resource-limited setting, where you might be short on 3D printing material, or maybe you just want to print more in a shorter period of time, you might opt for that design to serve as your spacer or diffuser to use these meter dose inhalers in treating these kind of earlier stage COVID patients.

The other thing that we became aware of was the need for an "intubation chamber" is what it was called initially. So this was a chamber that would have been placed over the patient, and maybe you've seen some of this because I've seen that Memorial Hermann is now working on one. Methodist kind of had their own kind of box design, but it's basically an enclosure over the patient, where they can do intubation procedures and not worry too much about having somebody cough on them or sneeze on them while they're trying to do this. It's just a safer way for them to work. But we found in looking at this that there are many different procedures or potential applications for this type of chamber. It has a filter on it and a vacuum pump. So bronchoscopy procedures, the intubation procedures, maybe if you want to treat a patient with using a nasal cannula.

The other thing is a hospital up in Dallas that reached out, and they wanted something that they could use to transport patients through the hospital in a safe manner, so this kind of hood that fits over them. It actually reminds me of when I was a young child, I had problems with asthma, so I had experience with the inhalers, but the other thing they did was they kept me in an oxygen tent. And so it kind of reminded me that. It's almost like a little tent that fits over the upper torso of the patient, but it's got holes in it where you know the clinicians can reach in there and do their procedures.

Another one is, we have been thinking about the ventilators, as John said, but my approach to that is, after a lot of deliberation, we've seen some of these designs where you can treat more than one patient on a single ventilator. You'll see those out there; it's really just incredibly risky, and so if you've got no other choice, if your choice is death or split the ventilator then, then maybe that's what you do, but it's something that you really don't want to do. And as I tried to find ways to do that safely, adding independent control to the different lines, I concluded that you may as well just develop independent ventilators.

And so, Jimmy Moore, if you used to be in biomedical engineering here at A&M, had been working on a design, and actually has shared all his stuff with us. And so now we're just now getting all the parts and things that we need to kind of replicate his system and be part of the design process with him. He's still iterating that design daily.

John and I talked with Billy Cone down at CDI earlier. They've been working on a design. I think we all think, or hope, that some of these larger companies like Dyson, you've probably heard they've gotten involved with the ventilators. And they've got massive manufacturing capabilities that hopefully within a couple of weeks, this won't be as critical of a need as it is now. I still don't know if that's going to be true, kind of globally, particularly in resource-limited settings like Rwanda, where I go every summer. How are they going to handle these things?

They may still rely on these lower-tech solutions to these kinds of problems. Maybe a little higher risk, but again if the only option is dying, you're going to take the risk, right?

So, we're going to continue that design. We're going to do some cross-pollination of ideas with CDI, which I think is really good. I'm glad that Billy seemed to be very open to that. So John and I will be working with him. Reza Langari, by the way, is the one who is helping me with this here at A&M. In fact, it's his lab that's taken of the logistics of it, ordering the parts and bringing those in. They're going to build a system; we're going to build a system, and then, as I said, we'll work with Jimmy. We're going to work with the clinicians down at Methodist Hospital in terms of getting their input about what they want to see in this design to make it work in a clinical setting and go forward that way with that.

But the other thing that's kind of interesting, they asked me the other day about stands for iPads. I mean, that sounds like a trivial thing, but they use these when they're doing patient consults. Sometimes it's these little things that are just kind of stressing them out and making their job more difficult. So, we uploaded that to our Slack forum if somebody wants to take that on. I think they said they needed 20 of them.

That's the other thing that I want to emphasize is that everyone is familiar with the mask and the ventilator, or maybe the ability to reuse PPE, but as some of these other problems, like the diffuser shortage, the intubation chamber, that's kind of an emerging problem that really wasn't anticipated before all this started, to go critical, right?

And so, I'm interested in talking even with the other hospital, as Joe said, they're starting to reach out now because they're starting to see A&M as one of these institutions that's listening to them through some of these things that we're starting to get out there. In fact, I talked with Scott & White today, because here I am doing all this work down in Houston, and I'm just now talking to my local hospital.

So I think when you talk to the local hospitals, you might be surprised by what you find in terms of what their needs are. Everybody's thinking at the end of the road, the ventilator, at least with the patients, the ventilator. And obviously, at the frontline the mask for the clinicians to kind of keep them safe, but there's so much that goes on in between, where these shortages are starting to arise as well, and I think that there are going to be additional opportunities there. Whether it's this chamber I was talking about to move a patient from point A to point B, or some of these other things that have come up that I've already kind of mentioned.

Joe: Thanks, Michael. So, I think about a week ago, or so, Michael came to Saurabh and me, and told us that he had 3D printed his own design for a diffuser to go on inhalers and had talked to physicians at Methodist and said that they wanted 200.

And this is about a little over a week ago, I think, and I think I gave him some kind of a reaction like, “Well, that’s kind of a crazy idea, because universities don’t manufacture things, and second, we definitely wouldn’t hand them to patients in a hospital, the liability would be incredible.”

And I was wrong. I found out in a very short amount of time, and Saurabh can talk about this process a little bit more in detail, but in a very short amount of time, we had a lot of people across the whole university system work together to put together a contract. And Dr. (Michael) Moreno 3D printed these and delivered them to Methodist Hospital this week, so it was a really remarkable achievement. And actually, what’s also timely is a video that has just been released on this story.

So if you can go to the system website, it might also be on the College of Engineering website now, you can see that. I would expect in days to come, you might see similar to Dr. (John) Criscione was on KBTX the other day, I think. You’ll probably also be on the news, too, for that story, so it’s a great story.

I think I’ll hand it over…

Michael: Can I say one thing since you brought that up? The other thing about this is the urgency. And that urgency goes all the way through The University System, so like you said, I printed them, but actually, it was the people at FEDC that printed them. Right? There were a lot of people that had to come together. What you, Joe, did a great job in terms of you and I had a lot of late-night calls, and the willingness of the people at legal, at OTC, and all these different parts of The University System have all kind of kicked into “urgent mode” and are making these things happen really, really fast. This is not something that one person does. There are a lot of people that were involved in this.

Joe: Yeah, very, very exciting. And also, again, you just like Dr. Criscione, very humble. [chuckles]

I’ll hand this over to Saurabh, and he has a great role at our university and also at TEES, at being involved with Commercialization and Entrepreneurship and meeting that up. So, he’s been involved with all these processes. And hopefully, I really look forward to hearing from him and talking to you about these processes.

Saurabh: Okay, so I will start off more about the process and the response. You heard two great examples of the first two projects we had, and what started off maybe two weeks back as one email has turned into a pretty complicated exercise today.

When you look at how many different touchpoints, we have every hour with different groups. So, as the requests started coming initially from hospitals or internally, what we have tried to do is really stratified into two separate buckets.

One is more near-term requests, which are coming from hospitals, and examples you heard from Mike. The Methodist was the first one, which came in, and then certainly the DIY mask was more of a response that in this environment where we cannot have hundreds of people in the same building doing it, how we can deploy a solution where anyone can replicate. So that was the genesis of the DIY mask.

But what has happened over the last 10 days now, we had to create a process, because this is just not a technical challenge that is thrown to us. Once we are talking with someone who has a need, there are typically three things happening: Either they have a design, which could be an STL 5 (stereolithography), they want to send to us, or they want us to help them design and prototype. Hospitals also want the manufacture, like Mike's example; they want 200 of them. And none of them are typical isolated activities because we have to also understand how these things are going to happen from a transactional standpoint that we just could not print it and go and give it to them in a hospital.

So, what we have tried to do is, from an external input standpoint, when we have an API or when we have a physician trying to reach out to us internally, we have set up a process where we are looking at: does it need manufacturing? Does it just need prototyping on a design, or does it need all three of them design, prototype, and manufacturing? And based on that, we're trying to connect it to the right people across the system in TEES, and that requires folks in Risk and Compliance. We are talking to the General Counsel's Office. We are talking about contracting because all of these three things are important in this process.

At this point, we have multiple hospitals across the state, we have nonprofit foundations, we have government agencies, all these groups reaching out to us, and we are trying to make a decision, number one. Can we do the projects? Are we able to point them to the right people outside? In cases, we are doing it, who could be the PI, if there is a PI associated with the project? And number three, if we just an open request, we are trying to identify across other agencies in TEES, can they help us in scaling it up?

Because all of the requests we are getting have a timeline of two to three weeks or sometimes two to three *days*, and none of them, do we have the luxury of starting an internal process of where it goes.

So, a couple of things. On our end, we have an external process, now internal process, there's an RFI, which is kind of a gateway for these ideas to come in, but still, people are reaching out

to us, so we are trying to handle them in a much more organized fashion. The wait was maybe seven or 10 days back. At the same time, for all the faculty, you might receive the request, so you might have your own ideas.

One of the things as a caveat to be, you have to keep in mind that we are talking in most cases, medical devices. We are talking patient-facing ideas, any of these things to go out. You will need in some shape or form, to communicate to us intellectual property matters. Again, Mike, in his process, we have dealt with that in a certain fashion.

Are you downloading something from the internet? Do you know the source of intellectual property? Endeavor liability? COVID-19 will pass by, but we will have issues after that. There will be trial lawyers who will look for places to go after, so all this is very careful in looking at who will be using it, what the methodology will be for the delivery of the idea. Certainly, there is an EUA from the FDA, which is Emergency User Authorization.

But it's a complicated document. It's not something anyone can look up and make a decision. So from the standpoint of an innovator, if you have ideas, you have external people reaching out to you, we have a process now to at least direct you in a direction that if we need to design or create five or six prototypes, or produce 200 of them, how we can approach those issues and try to help you move in those directions.

Q&A Section

Joe: Okay, thank you. We have some questions coming in, and also I'll just ask a couple of questions that I've thought about to the panelists.

What are your thoughts about somebody approaching you with an STL file, and they say, "Hey, we need to use your 3D printers, and then you're going to give it back to us, and then we're going to take it to some hospitals." So, maybe you guys can address when that comes to your doorstep. What are your thoughts there?

Saurabh: I would just give from the standpoint of the process. We are getting this request a lot, and just my interface with our legal folks. The first question is, do you know when the STL file is coming? Is it an open-source from where they are? What kind of IP is behind the STL file?

And I think to go by Mike, I didn't talk about it. Mike also wanted to release his STL file, which was his own design. There is a process of releasing it on STL file, too, with a disclaimer. So, if you just get an STL file online, please check with us. We will try to talk with Risk and Compliance and OGC that what is the source of STL file, and if you're printing and sharing prototypes, we have the right disclaimers and liability issues handled before they leave our system.

Joe: Yeah, you bring up a point. I think, maybe, before you say something…

John, Mike, you can say something about the process you went through, and he pointed out. So, the diffusers that were delivered to Houston Methodist Hospital. Dr. (Michael) Moreno also made his STL available on the EnMed website for others to now print his diffuser and then also do something similar to him. So, maybe you can say something a little bit about what it was like for you to take one of your STL files and put that on the web?

Michael: Well, the first thing is that the circumstances that we're in are really unique. Right? And these are, I'll stop short of calling this a desperate need, but it's an urgent need. And so, obviously, the rules are changed a little bit, and so trying to… and some cases, they're changing the way that's not clearly defined.

This is one of those times where I'm grateful that I had the team behind me that kind of raises some of the issues because if I was doing this solo, I'm not sure I would have handled [chuckles] it the right way. But it did involve kind of looking at prior art, so we based it on a patent that had already expired, we actually had a feature in there that would kind of create a vortex, but we found a similar patent, so we just removed that feature.

So that was the first thing, was being sure that the IP was clear. But the other thing is that it's a Class II medical device. And if this were something that we wanted to start a company and go to market, there's testing that would have been required for it. And that testing, we haven't done yet.

David Stack was doing the testing, and so, what ended up being involved in this case, was because of the circumstances of the pandemic, Methodist Hospital essentially assumed the liability, the potential liability that we associate with this.

This is a very simple device, so I don't think the concern is very high, but, obviously, when you start talking about ventilators or other things like that…I mean, they go through so much preclinical testing, and whatever solutions kind of come up that are improvised now, there's not going to be an opportunity to do that kind of rigorous vetting of the ideas.

And then, to go to some of John's point again, and John, I'll segue to you, if you want to take over here. The other concern is the 3D printing stuff. Sometimes the quality of it is not good. I think his testing showed that if you use any of those 3D-printed masks "as is," as they come off the printer, that have been uploaded or made freely available on the web. John, go ahead and tell us how those are going to perform.

John: Yeah, you read my mind, Mike, that's exactly what I was going to say. If somebody contacts you and wants you to start printing something, my first question's got to be, what's the indication? What is this thing going to be used for?

And then, you have to ask you know based on that, well, what kind of testing can we do? You can't do exhaustive testing that you would be required for verification and validation of a medical device, but you can use some basic testing, and the rest of the community here, we reached out to people to do the material testing.

Occupational Health and Safety was extremely helpful with the mask fit, the qualitative fit testing, the quantitative fit testing. And the 3D masks don't fit your face. They leak like crazy; there's not enough filter area. I mean, they look like a mask, they talk like a mask, but they don't perform like an N95 mask would. So, we ditched those immediately and said, "If you don't have a gasket, if we don't increase the filter area, don't even bother with this solution."

Joe: You guys have raised some good points. I think, for the process of us making devices here on campus or supplies and then giving them out, not only do they have to be effective, but we had to handle issues with intellectual property, as you said, with the liability, and also FDA.

So that's just something that we had to assess, and the risk associated with that, particularly if you're making something for the first time, and it's not an exact replica of something already on the market that's FDA regulated.

So, these are all sorts of issues that had to be addressed. And I would just say to everybody on the panel, as you think of questions, feel free to type them in on the chatbox, and Sunay and I can field them as they come along.

One question I see right here is specific about these regulations. Do we have any guidelines or frequently asked questions on what projects involve regulations or how to find out?

John: I would say as long as you make a claim, so a medical device is any device that makes a medical claim. So it's all in what you claim for it to do. So, if you claim for it to treat something, it's now a medical device, and that's why that's careful on many of the web stuff. They don't try to make medical claims; they try to make health claims or exercise claims. Those don't make it a medical device. As soon as you claim something, then you need evidence that that claim is correct.

So, you have to be very careful in the medical device space, so I like to point out that in the medical industry, we do not license engineers, we license products. So, it's very different than say civil or some of the other areas where we license the engineer.

But, here we just don't do that. We test and evaluate the products, and a lot of that's being relaxed, so I just had two calls this week with, basically, standards and licensing authorities, to talk about: can we have different grades of a license, different grades of standard in this situation?

And they're talking about the minimum viability standard. So what would something have to have minimally to be helpful? Now, it's not going to meet the full standard, but which ones can we not relax? So, which standards can we relax, and which ones can we not relax, basically, is what a lot of these calls were about.

So, it's shifting; it's out there. Just don't work alone—contact people. Contact the experts. Contact Joe; he'll get you in and to the right people, both legal as well as expertise.

Joe: That's a great point.

That was going to be my follow up question there. Let's say, anybody who's on the panel or anyone out there, they have a friend or family member or anyone who is in a hospital, even faculty who have spouses who are physicians and nurses, and they come back, and they say, "Hey, we're running out of this. Could you go make that?" Or, "We have an STL file for making this," what should you do?

So I guess my question to the panel is if someone comes to you and says that, what do you think would be the first step in that process for us to really consider something?

John: I'd just be real clear on the indication. The entire medical device design process starts with the clinical indication. What's it going to be used for? What's it to replace? That type of stuff. There's probably already a standard out there for the thing. Even surgical gowns have a standard. There's a lot of stuff out there, and I encourage everybody: let the clinical arena be the guide.

So, their demands are real; let's try to meet their demands and listen to them. What I want to discourage you from is looking at your own portfolio and saying, well, this could be useful for COVID, and that may or may not be true. There's no question about that.

It's just the route to clinical adoption for that type of investigation is through an FDA premarket approval or 510 K or something.

Because the other route is the hospital needs it, it's a crisis situation. And then they can actually bypass the regulation if they require it if their hospital administration agrees to it.

If they consult with their IRBs and say, “Yes, we’re going to use this because to not use it would be even more of a risk.”

So, just be careful there. The clinical entity is leading it. You’re in far better, far firmer ground. If you’re leading it, if it’s your idea, and if you want to see it clinically adopted, it’s going to be a much longer, harder process. It may be a great idea; I’m not saying it’s not a great idea; it could be an excellent idea. It’s just…the pathway for that is far more difficult and uncertain.

Michael: Yeah, I’ll definitely second working with conditions. That’s what’s made everything that I’ve been working on possible. We’re working directly with them literally on every project that I’ve been talking about. Their input is vital. You can’t do it without them, really, or you shouldn’t.

And then the other thing that I’ll just add is that what John’s talking about is something that you should generally do if you want to get into the medical technology space, but under these conditions, in particular, they’re very good at describing why you need, like with the spacer for example, which would normally need testing, why it’s critical now. Why you have to do it this way right now, they can actually define that problem, put it in that context, because the circumstances now are different. The condition can do that you can’t; it’s not good to do it by reading it on the web. Talk to the people in the hospital, and they’ll enlighten you. There are a lot of things that I learned in these conversations.

One thing that hasn’t been mentioned a lot in the media that I think is worth mentioning is when they talked about the hospitals being overwhelmed, most of it has been about the number, or the rise of these COVID cases that [were] going to do that. But what they’ve actually found is that it’s the *potential* COVID cases. They’re really running up the numbers. I talked with somebody who’s the director of a 25-bed ICU in Minnesota, and she was told me that most of the patients we get in that we’re testing for COVID are actually testing *negative*. But we have to treat them as if they’re positive, and it takes a week to get the results. So they’re just burning through the PPE, the masks, and these things that are not reusable, on these patients that in the end may not even have COVID.

So they’re being overwhelmed by the rise in COVID patients, but also just the rise in patients that *potentially* have COVID because maybe they’re exhibiting some other respiratory or another kind of symptom that suggests they should be tested.

Joe: That’s great.

I'm being reminded here in my chatbox about the Aggies Against COVID-19 virtual student competition. So, what are, and I know there're numerous students in there, maybe somewhere on the upwards of 70 to 100 students who are now there and forming teams, and want to help in this process. What are some thoughts, comments you would have for students, and how they could get involved?

John: Yeah, I think the challenge group is certainly the best way. I like to see that. We all know Big Event was canceled. So, this is an opportunity if people want to serve and have some time. I think this is a great way to do it.

Saurabh: I think the challenge here is only about this social distancing, but a lot of students who are still in College Station are happy to help. So I think this could be a remote exercise or certainly, the group of students are together, they can do that. So, I think we are getting requests, which requires mobilization of a larger group of people to do things like… and if you want replicated DIY masks and 200, or 500, or 1000 of them will require a very motivated group of people to do that. So, I think students have lapped it up. What we heard from Rodney (Boehm) and Mike [is that] the number of applications coming in is huge. So they are ready to help.

So, if anything comes to your mind which can fit that model of having multiple students able to be a force multiplier, please reach out, and you can directly send an email to Rodney Boehm or Magda Lagudas, and they will throw it out. So, next week there again, pushing out a set of problems to students.

So absolutely, if you have an idea but your trick was 15, 20 people to replicate a process that can go out to a larger group of people, I think we have this fantastic effort ongoing at this point.

Joe: Great. Thanks for reminding everyone of that too. There is a website up there available for that.

Question from Dr. Reddy, which I think is good, you may have touched on this a little bit, but it'd be good to talk about this again. So he says, "Can I tell others that we have diffuser spacer designs available? New York hospitals are in desperate need of any help."

Michael: Yes, absolutely. That's something that's on the EnMed site. The STL files are already available. So, if they go to EnMed.tamu.edu, they can see the different designs that we have, and there's a link there to the STL files, where they can download them, and then hopefully, they can find somebody locally that can print them for them. I will say that that may be more difficult than one might think because you start to get into issues of manufacturing.

So, this was another thing that we had talked about with the diffuser was, should we just give Methodist the files and let them find their own manufacturer of them because it was potentially going to add liability for the university to actually provide the device versus just providing the file. So, there may be manufacturers out there that might be averse to that. But again, the way we got around it was Methodist was willing to sign the agreement, the liability waiver. And I'm imagining that under these circumstances, most hospitals are going to do that, particularly with this device, is a very simple device in terms of the way it functions.

Joe: Yeah, thanks for even making that available. I think, originally, when I thought about this, I thought, "Wow, 200, and hand delivering it." But, I think the impact of this really could be in the hundreds of thousands, because you've made the file available to anyone to download, anyone who has a 3D printer can make these and use them. So, I think that's incredible.

Another question from the audience here.

Do you have a plan to reach out to remote communities in Texas and helping with their needs? For example, Monahans, Texas reached out with their need for expanding their only ventilator and their possibility of getting more is not likely.

John: Yeah, I think I've been reluctant to get too involved in the ventilators yet without further testing. I think guidance from the Pulmonary Association says, "Don't split ventilators." Right now, they're saying that, basically, you're at risk of harming two patients, instead of helping one. So, they're actually going against doing that. They just have triage guidelines instead, and say which patient should you put on a ventilator rather than to split it. It's a desperate situation; it's a crisis.

I think all we need or maybe some stripped-down ventilators that have minimum viability standards. And that's kind of where I'm putting my effort right now is just, what's going to be the basic needs, so that we can make more with the basic needs, rather than making fewer of the full-blown does-everything ventilator.

Joe: I think the…go ahead.

Michael: I was going to say, and where you're finding some of those ventilators is at the vet school. So, their ventilators are much simpler, right? And, we wanted one of theirs to kind of work with them. We were thinking about doing the split design, so they actually donated one to us. It came from the large animal clinic, which had a larger capacity because this was the thinking at the time that it'd be easier to treat more patients if you had this larger capacity. But, like I said, as you start to look into it, as John mentioned, the potential to injure, do more damage, more harm than good, made it not worth it.

As I started thinking about all the things that you would have to do to kind of make it safe, the conclusion I came to was, you may as well just develop separate ventilators. And I think the other thing I found out that's worth mentioning is the vet school told me that the state has already told them that they need to be prepared to hand their ventilators over. So, there are some hospitals that, in the end, will be using veterinary ventilators. And I think that they would represent, to some extent, what John's talking about in terms of the minimum function that might be clinically viable.

Joe: You guys brought up some great points. As I've and many people have seen on the web, one of the biggest things are people making these two-way and four-way adapters of two or four people can use one ventilator.

And I was on the phone today with Dr. Pettigrew is the Dean of EnMed program, and he said, "Just imagine you're on one of those tubes and Shaquille O'Neal is on the other. That's really bad news for you because that two-way or four-way valve is not doing anything to regulate the differences in pressure that's needed for different patients." He created a very good illustration for me to understand. And hopefully, we'll get some better information out there on the web, and people will stop presenting these two- and four-way valves as a viable option.

Another question's coming in on the chatbox here.

During this desperately-busy time, instead of thinking about getting involved in PPE for medical professionals, why not think about products and ideas that discourage and decrease the number of community infections? We don't have all these hoops to jump through and are still able to contribute in some big ways to this terrible situation.

Saurabh: So, I will. There's a pretty large group on public health, and we also have faculty from computer science who are designing apps for preventing community spread and contact tracing. They are going after this from multiple different routes of getting data using GPS data, Bluetooth RF signals, and also they're using geospatial data, and certainly the biological data. So, to answer that question, there are multiple groups, and they're very close to working with Texas Division of Emergency Management (TDEM), our governor's office, because, frankly speaking, the highest priority today in governor's office is to slow down the spread. I think everything else they are hoping they will catch up with the supply chain at some point.

So the question is very good, and in my last call where I heard this, that group of public health is pretty big at this point. We're talking every day with the governor's office, and they are bringing in people with every background: computer science, geospatial folks are in that group, and certainly the population modeling and all that group. So, they are designing apps; they're

coming up with multiple ways to utilize real-time data to slow down people, other than just basic ads on TV.

So, the A&M System is part of that effort at this point, including the College of Engineering.

Joe: Yeah, so I thought your answer was outstanding, and I think that was a great question. It was good to know most of this panel, we've highlighted PPE, supplies, devices, equipment, but we also have other faculty, even in our own College of Engineering and Computer Science, people are have pitched ideas through the RFI to monitor the spread like things with mobile devices, all across the campus, other areas like that.

So it's good that we're doing things on both fronts: trying to meet immediate needs for physicians, but also trying to stop the spread.

Michael: If I can say just real quick, so, the other thing that I put up on the EnMed website was a repository for people to post problems. What we're looking for is an emphasis on those things that were unanticipated. As I've been saying, everybody knows about the ventilator need, the mask need, but some of these things that are more like the diffuser or the incubation chamber that we didn't see coming and hopefully we'll get some participation in that forum that we're providing.

And if we do, one of the things I'm anticipating is that we might find that things that are common in one industry are not common in the medical industry. For example, when the hospital told me, "If you can make an autoclavable mask, we would jump all over that." There's got to already be an industry that has an autoclavable mask. I'm just shocked that that doesn't already exist, but what occurred to me is it just doesn't exist apparently in the medical industry. They've kind of burn this disposable paradigm. We wear the mask, and then you throw it away, and you put on another one as if the supply will be infinite, and you don't worry about it. But I'm thinking that, if there are engineers that are listening right now that are from other disciplines, if they can have access to the problems, they may find that a solution to them may already exist in their industry; it's just not in the medical field.

Saurabh: Mmmhmm, that's true.

Joe: Just open it up to the audience: Are there any other questions that you have for our panelists? Feel free to type them in.

I see, and I have to figure out how to do this. I'm going to unmute somebody so they can [speak] because they have raised their hand, I think. Okay? Feel free to speak if you…

Participant 2: Yes, hi. Good evening. My name is Marwan Khraisheh. I'm from the Qatar campus, Mechanical Engineering.

We have a few faculty who are interested in contributing in any way. We have people working on CFD analysis pipe and pumps design. We have a good 3D printing facility. People work on additive manufacturing. We had a brainstorming session this morning, and we are interested in working with main campus or contributing in any way we can. We are not under pressure like in the U.S. or our hospitals at this stage in handling the situations, but I think there's an opportunity to contribute to the situation here also in Qatar. How can we get involved in some of the activities that are taking place, or maybe pitching some ideas?

Joe: First off, I'd like to thank you for suggesting to help and contribute, and also thank you for dialing in very late in Qatar, because I can't even imagine what time it is there, but it might be past midnight.

Marwan: Approaching midnight. But, working at home, you kind of lose track of time, now. [laughs] So it's just all the time.

Joe: I think we're all feeling similar there. So, I would just say, feel free to reach out to Saurabh and me. And I'm on daily calls with Saurabh and Dr. (John) Criscione and Dr. (Michael) Moreno, so we'd love to get you in on one of those calls, maybe on a Zoom call, and talk to everyone who got involved over in Qatar, and figure out how we can work together.

Marwan: Okay. Thanks.

Joe: Thank you. Any other comments or questions from the audience for our panel members? Okay, I think I see more folks.

Go ahead, Norman.

Norman: Yes sir, just curious, to the question follow up out of Qatar campus. Has that RFI email already gone out? Or is that not going out yet until next week? I can't remember that timeframe.

Joe: The RFI was in our research digest yesterday. There is a website that's up, and we've already started receiving RFIs. At the beginning of the chatbox, I put a link to the RFI as well.

Okay. Anyone else?

Michael: I have a quick question for John that might be of interest. I was thinking about this because the gentleman from Qatar mentioned modeling. CFD in particular, but I'm curious if anybody's developed any good models for the filtering process? Because there's this weird thing about the filters called the "maximum penetrating particle size." So, it turns out these 300 nanometers (nm) particles; they tend to be the ones that get through the filter.

Viruses are much smaller than that, but they don't make it through because they don't really follow a linear path. They just kind of wander around and just run into a fiber on the mask.

But there are other mechanisms. There are at least four or five mechanisms by which the filters work. And I thought it might be interesting if somebody had tried to model that process, given all the attention that's going to different filtering materials that might be used in these medical applications.

Were you aware of anything, John? I'm not aware of anything that's been done like that.

Joe: Trying to unmute you, John. There you go.

John: All right, how's that? I think we were… You were unmuting me, and I was pressing the button, and muting me, and that was a lot of fun there.

So, yeah, it's a good question, Mike. I think though that's a longer-term question. I don't discourage anybody from doing that, but I don't see the results of that being utilized in this crisis situation.

The FDA has on their website the .3 micrometer particle, and the chance of that getting through. And I think if we stick with that, then that's what the healthcare people want. If they start asking this question, then maybe, but I have yet to see somebody in the healthcare environment say, "Hey, let's explore the particle size type stuff. Now, they just say, "Look, this is the standard we're comfortable with. We want something to meet the standard, or we want to know to what degree we're meeting the standard." And then, the science will turn on. I'm not trying to discourage it. I'm just saying I don't think scientific investigations necessarily can be done in the speed at which people need to in the crisis.

Joe: Anyone else?

Participant 3: Joe, I don't know if you can hear me.

Joe: We can.

Research Exemptions

Participant 3: …to mention that this is a great effort with more than 50 participants, and the panel gave us great ideas, and also the excitement of not only implementing ideas but also helping now during this time of need.

Many of the participants probably received this memo that came out from Dr. Banks about having only essential activities in our research laboratories, and COVID-19 is an exception. So, if you all continue with ideas, and you need your labs to be operating, please file for an exemption. It goes to Dr. Reddy. Reddy, I think you are one of the participants if you want to say a few more things about this.

Dr. Reddy: Okay. Yes, I'm on the list, and so we provided many reasons to ask for an exemption. And, as Dr. Dimitri mentioned that anything related to COVID-19 is an exception.

So I've already got three requests for exemptions, and I'm going to be moving them as soon as possible. The deadline is for tomorrow, so the sooner you apply, the less work, but we don't want to close things down for anything COVID-19-related.

We want to encourage you to keep your labs open to help all the medical efforts and all the other PIs that are working on these problems.

Closing Remarks

Joe: Okay, we're running close to the end of the hour. I want to thank both Dr. Lagudas and Dr. Reddy for being on this call and giving us more information about the new guidelines.

I want to thank our audience, but I also want to specifically thank our panel members for all the information they provided, and more specifically, about the work they're doing.

It's kind of fun. Everybody I talk to, I talk to about Dr. (Michael) Moreno and Dr. (John) Criscione and the things that they're doing and meeting immediate needs. Not only by giving things to the hospital, but also for the information you provide on the web for people to then use that information. So, I think that's been great.

And lastly, before we get off, another kind of hero of mine is Sunay, who's online. You probably don't know this, but for an entire university overnight to go online almost flawlessly is kind of amazing. And if you're like me and have interacted with lots of faculty members on campus who before this did absolutely nothing online, it's really kind of an amazing feat. So, I can only imagine what you've gone through over the past three to four weeks. So, we really thank you,

Sunay, for all the efforts you've [made] to make our university be able to go online, particularly in engineering. With the 21,000 students we have, it's kind of a heroic feat, so glad to have you on the panel, Sunay.

Sunay: It was a team effort. I think everybody contributed and made things happen, right? I think it's this…Everybody in the panel brought that up that everybody comes together and makes things happen. I think if people have not stepped out of their silos and said, "You know what, I'm going to do what I can to collapse any boundaries," we would never be anywhere.

Joe: Yeah, that's great. Okay, well, thank you, everybody, for attending the panel. And, of course, if you have ideas, please submit them through the RFI. Feel free to contact Saurabh or me with really major needs from hospitals. We're always fielding those. And I wish everybody the best.

Please stay safe, and please stay healthy. Thank you.

[Gig'em Aggies]