DANNY LENNON: Dr. Sohail, thank you so much for taking the time to talk to me on the podcast today, particularly given this very uncertain time, and I'm sure a very busy time for you, so thank you so much for your time today.

RIZWAN SOHAIL: It's a pleasure, thank you for having me.

DANNY LENNON: So before I get into some specific questions, maybe just to give people an idea of your background and your expertise that will come in very useful for this discussion, can you maybe give us an idea of the work you've done in the area of infectious disease and some of your credentials in the area?

RIZWAN SOHAIL: Yes, I'm a professor of medicine at the Mayo Clinic College of Medicine and Science, and I'm a consultant in the Division of Infectious Disease and Cardiovascular Medicine. I've been practicing infectious disease since 2002 and I got my medicine training in Chicago and then my infectious disease at Mayo Clinic, and in my practice I see patients with cardiovascular infectious disease but also immunocompromised patients including patients with one bone marrow transplants, different kinds of cancers, as well as the general infectious disease service.

DANNY LENNON: When we look at what most people will colloquially be saying of coronavirus, a more general term for the specific one we're talking about will be SARS-CoV-2, and this can lead to this disease COVID-19. So maybe first can you help people distinguish between those couple of terms, but also beyond that, how this specific coronavirus may be different to other types of coronavirus that we've seen?

RIZWAN SOHAIL: Yeah, so the coronaviruses have been around for a long time, and usually we have three to four different strains that circulate mostly in the wintertime, though they can be present occasionally during summertime. Now, some of those coronaviruses strains over time have evolved and jumped from animals to humans and some of the recent outbreaks have been with the first wave of the SARS virus and then the MERS virus, and the unique thing about these viruses, the SARS and the MERS was that they had much higher mortality rate compared to the traditional coronaviruses which typically infect like young adults and children and they cause mild respiratory illness. So the reported mortality rate, for instance, with SARS was like 10% and with MERS it was 20 to 30%, quite alarming. The most recent coronavirus which is now being called SARS coronavirus 2 and was previously called novel coronavirus 2019, this seems to have originated from either bats and mostly genetically seems to be most similar to the bat coronaviruses; but it's reported that another mammal, pangolins, can also transmit that. The disease that is being caused by the SARS coronavirus 2 or previously called the novel coronavirus 2019 and, in general terms, people have been referring just the Wuhan coronavirus, the disease is called COVID. So COVID is the name of the disease and the SARS-CoV-2 is the current official name of this virus.

DANNY LENNON: With this specific coronavirus, SARS-CoV-2, the main thing that at least was reported initially is that this is a respiratory droplet transmission predominantly. Do we know

anything more now about other potential modes of transmission?

RIZWAN SOHAIL: Yeah. So the primary mode is still the respiratory droplets. As we know, the respiratory droplets can go to 3 to 6 feet in air before they fall down to the ground, however, the virus can survive on surfaces as well. In perfect temperature and humidity, it can probably survive on surfaces for hours, though most people think that on surfaces such as metal like doorknobs and handles, it may survive for six to eight hours. So definitely, by touching the surfaces, it can be transmitted as well. In healthcare settings, where there are procedures which are being done which generate aerosols, like sometimes we do suctioning of the airways, there are nasopharyngeal swabs, so the procedures that generate aerosols then there could be potentially airborne transmission as well, and there are some reports of that happening; but usually, in public, it's mostly the respiratory droplets and may be contact with contaminated surfaces or what we refer to as fomites; but in the healthcare settings, patients on the ventilators and stuff, the aerosol generating procedures can also do that.

DANNY LENNON: Okay, so airborne transition is theoretically possible, but at the moment it seems to be confined to healthcare settings where we could have aerosolization of that virus. If that then airborne transmission is not as really a factor publicly for most people, and it is still respiratory droplet, can you maybe explain why that is a potentially important distinction?

RIZWAN SOHAIL: Yeah, the reason it's important is because when you see people in public, the general image that you see in the newspapers and in television is that people are wearing these masks because I think the masks are going to be very helpful in protecting them. It creates a false sense of security because sometimes people touch the mask and the mask itself can be contaminated because they are wearing it all day long. Then

they are not paying as much attention to surfaces where they may be picking it up. However, the mask does help to prevent spread from an infected person to the non-infected people, so the people who do have symptoms, if they go out in public, let's say, somebody got fever, sore throat, and cough, and wants to go see a doctor because they are aged above 65 or they have virus situation and they want to get tested, they should wear the mask, the surgical mask because it can reduce the risk of spread from the infected patients to not infected; however, for general public, it's not very helpful.

DANNY LENNON: What do we know about the time from first exposure to the virus to actual presenting with symptoms?

RIZWAN SOHAIL: Yes, so mostly the incubation period that has been recorded based on data from China and then Italy and Japan is that it's the general range is between four to six days – most people develop symptoms within a week of the exposure, the longer end has been 12-13 days. Now, there are some reports that people have gotten symptoms of infection up to three to four weeks after an initial exposure to a corona patient. It's really hard to know that maybe it's that they were exposed today and then they actually did not acquire the infection and then got exposed to someone else two weeks down the road that they did not know about, and in fact that's the actual exposure and it occurred and then come with symptoms four weeks later thinking that, oh I had a known exposure four weeks ago. So that's really not very well known, but it has described up to day 24 to 27 after the exposure, though I personally think that based on the publisher, it's really four to six days of incubation period. And just to add to that, one thing I think that's helpful to know about this incubation period is that it's been reassuring that the general recommendations that is being given to people to self-quarantine up to 14 days after an exposure I think is a good recommendation because I would say 99% or

more would develop symptoms within that two weeks' timeframe, and if they don't have symptoms then they likely have not acquired the virus or they're not transmitting, in general. Obviously, we know that there can be a minority of patients who have absolutely no symptoms at all, they could be shedding and that's kind of difficult to tell.

DANNY LENNON: So just on that, I think what has been communicated that seems quite clear is that people can still be a source of transmission for the virus before they develop symptoms, so at the current moment they're asymptomatic but can still spread it before they develop symptoms but it does seem, or at least I've seen one report and maybe you can clarify if this is correct, that it seems incredibly rare for people to have the disease and experience no symptoms at all at any point. Is that accurate?

RIZWAN SOHAIL: Yeah, and I think one of the reasons we don't know the exact answer to that is because there are two types of tests which are done to look for presence of infection in someone. Now, mostly what we're doing these days or relying on testing is the PCR, the DNA tests, or in this particular case, the RNA test to see for the presence of infection. However, we know from other diseases, for instance, that the serologic tests which look at the presence of antibodies or proteins which are made in response to infection can detect asymptomatic infections in maybe a wider population. Because we don't really have good serologic at the moment, reliable ones which can distinguish perhaps between all coronaviruses, the new ones, we are doing a PCR test. Now, at present, the exact sensitivity which is the ability to detect all cases of infection with the PCR test is not really well known. The reports vary that it could be 70% or up to 90%, but the PCR test is not 100%, so that's kind of one limitation of the testing that we can't really tell. However, on the other hand, regarding your original question, based on again what's published so far, it seems very uncommon that patients will have absolutely

no symptoms and be infectious to others. Now, they may be ignoring the symptoms because they've been quite mild, they may have a little bit of fever, may not really be 104 degrees that people may consider like worrisome, they may have a little bit of cough, may not just be feeling well, but they usually do have some symptoms whether you notice them or not.

DANNY LENNON: Do we know yet if the severity of the disease is impacted by the length or the magnitude of someone's exposure?

RIZWAN SOHAIL: Overall, once you're exposed, then the risk of severe illness is primarily dependent on the overall health and the age of the patient. Obviously, the longer you are exposed, the more likely that you'll get it, but once you get it, then it's really the health and the age of the patient that has been shown to be the primary determinant of how sick they will get.

DANNY LENNON: What do we know about the disease mechanism and pathology?

RIZWAN SOHAIL: Yeah, so there seems to be two different things. First of all, in the electron microscopies that have been done with the previous coronaviruses and pathogenesis with this one is that, first of all, the virus seems to have a direct, what's called a cytopathic effect or CPE where it's directly toxic to the respiratory cells, especially the alveolar cells. So then the first wave of damage is done directly by the virus itself. Then some patients have a very robust immune response to the infection which then does the second wave of damage to lung parenchyma. And therefore I think some of the things that are being tried in terms of treatment which perhaps we'll talk about later is that there's the focus on blocking the viral replication in the initial phase and then trying to block the immune response using different medications and see if that's helpful. So it's a combination of both, but a lot of damage seems to be done directly by the virus itself.

DANNY LENNON: Okay. So in patients that unfortunately do end up dying, what is the breakdown of what that classification of what they actually died from is, because I've seen that there may be differences in various organ failures and so on?

RIZWAN SOHAIL: Yeah, so I think primarily it seems to be that the most of the deaths are related to severe respiratory infection and acute respiratory distress syndrome, or what's called ARDS. Now, once patients develop a severe ARDS and they're in the ICU, then with that comes the insensible losses and people get electrolyte imbalance issues, and get dehydrated, so there could be renal failure as well. And then with the immune response you can have multiorgan failure, there can be visit allocation and stuff like that as well. So there could be a bunch of downstream effects but the primary cause of death remains the respiratory failure.

DANNY LENNON: So in some of the emerging data we have of patients who have had the disease but then recovered, has there been anything that so far looked at whether they can go and be reinfected in the same way or whether they establish some sort of immunity?

RIZWAN SOHAIL: Yeah, there are some reports of people getting sick again after recovering from the initial phase. To me, it's really unclear at the moment, is it because they're getting the superimposed bacterial infection or is it that the virus itself is reemerging. There is also some suggestion that there are two different strains of the virus going around, so is it possible that they get infected with one and then the second one later on. And then, there's also this suggestion that one of the viral strains is less virulent and the other one is more, and more deaths are being caused by the more virulent strain. Now, we do know based on the genetic sequences that there are differences, however, I think we are not at that point where we can say, conclusively, the exact reasons for why some people, even though if they're on the same age group and the same health condition, are getting a more

severe infection compared to majority of others which seem to have a pretty mild illness.

DANNY LENNON: In terms of transmissibility, on average, for someone that is infected, how many people are they likely to infect based on current averages?

RIZWAN SOHAIL: Yeah, based on the current averages, it seems like one infected individual can infect three to four more people. But as you said, it can depend on the location and the setting. For instance, there is this report of this one woman in South Korea who went to a church and infected 30 plus individuals at that location. So it's quite possible that in crowded places like restaurants this is a worship, airports, and stuff, there could be higher transmission. But in a general environment, it seems that one infected person will infect three to four.

DANNY LENNON: Right. And so, like you say, there's mitigating factors that may change that number and presumably this is one of the reasons why that kind of first line of defense that nearly every health organization will first point to, ends up being around social distancing and being able to potentially change that number – is that one of the things that impacts that?

RIZWAN SOHAIL: Yeah, absolutely. And I think, especially for people who are at risk for higher complications, for them it's even more important than the general public to avoid going to crowded places like restaurants, churches, mosques, synagogues, temples, airports, bars, cinemas, places like that, because the risk of transmission is much higher there. Even within those locations, I think if people are less crowded and there are smaller gatherings then the risk definitely goes down. Now, part of the mitigation strategies, of course, is that in an ideal world, if you could have very wide the available testing, then you could do early testing for people with minimal symptoms or mild symptoms and advise them self-quarantine, because at the moment the big problem is that people with milder symptoms,

they continue to go out because they don't feel sick enough to stay home and that has been a major factor in transmitting the disease to others.

DANNY LENNON: Right, and I think this is actually a really important point that I wanted to ask you about that what makes part of this current pandemic so, maybe, scary in some way is that people might look at it and look at say the mortality statistics that we currently have and compare that to other viruses and pandemics that have previously occurred and may see that it has a lower mortality than some, but in terms of the transmissibility and, like you say, the ability for people who are infectious to be able to move around, that isn't as often the case with some of those others, in that people get sick very quickly to the point where they're almost bedridden – can you maybe talk a bit about how this novel coronavirus compares to some other viruses that we've heard about in the past both in terms of lethality and then also the transmissibility and then what makes the combination of those things particularly unique about what we're currently facing?

RIZWAN SOHAIL: Yes, so for instance, a lot of comparison is made to seasonal influenza virus which overall is reported to have a mortality estimated, depending on the population, 0.1 to 0.2%. On the other hand the SARS epidemic that happened seven years ago had a mortality rate of like 10%. MERS had 30%; and then Ebola which was a big scare a few years back, and the reported mortality, depending on the country, 60 to 80%. But I think some of the unique factors which have happened over time, first of all, this is a very easily transmissible, then globally we have a much higher proportion of at-risk people who are above age 60 or 65, then we have a, you know, as the population is ageing, we have prevalence of chronic diseases like diabetes, heart disease, there are more people on immunosuppressive therapy, there's a lot more global travel. So I think the ease of travel, the ease of transmissibility, a higher

proportion of elderly population with multiple comorbid condition and different medications and stuff like that, makes this recipe for a situation where we have lot of cases coming to the healthcare system.

Now, the other difficult part of course is that, let's assume that even though mortality figures are at the lower end of somewhere close to 0.5%. Now, our healthcare systems are designed in terms of capacity to accommodate the usual number of patients that will require hospitalization with respiratory viruses. So if a given hospital has a capacity to handle, let's see, 50 patients in a week in their ICU with the severe respiratory illness, now even if you just double that number and if they have hundred patients to show up in that week, that require critical care and they only have 50 beds, now we get into that situation where you have to kind of decide who are you going to ventilate and who you're not going to ventilate. So even if we believe that folks were saying that it's just as bad as regular flu, we are just not prepared to take care of the two flu epidemics simultaneously, that's not what the healthcare system is designed for. And in a more realistic way, this will create four times the number of influenza – compared to influenza related cases that end up in the hospital and critical care, and we certainly don't have setup ready for that, and that's why there's been a lot of emphasis on this term that has become quite mainstream now which is flattening the curve that even if we end up having the same number of patients, if we can slow it down so we have the capacity to take care of them, over time rather than trying to take it of them all at one time, and that would make a huge difference in how we allocate healthcare resources.

DANNY LENNON: As you say, that mortality rate is of course not just inherent to the virus alone but it's going to be mediated by many things, whether that's population demographics, but predominantly also how the healthcare system holds up or doesn't, and obviously healthcare systems vary

from country to country but also the strategies being used by different jurisdictions are going to differ, and so the capacity for each of them may be different, and so the knock-on consequences could be very different, because I think as you as you outlined there's a certain capacity to be able to hold those patients but even beyond that even patients who are not COVID-19 patients then get impacted in any healthcare system that gets overflooded, and then this all kind of trickles back to what we said around social distancing is not just about not contracting the virus or even spreading to one other people, it's being able to essentially buy more time for, are the healthcare system as, and thinking of that as the focal point of how we can battle all this pandemic, would that be accurate?

RIZWAN SOHAIL: Exactly, and I think there are many other benefits of this flattening the curve that not only we have the capacity to take care of those patients, but also if we have few more weeks or months to deal with all these patients that we're expected to deal with, we will learn more about this virus, we may have some medications with proven efficacy for moderate to severe illness, this also creates some degree of herd immunity in the population. And then another benefit of flattening the curve is that, at least the data from the Japan shows that there was a dramatic decrease in even the regular flu with social distancing. So which means that the social distancing will not only have less coronavirus cases, but also rest less of the influenza, RSV, rhinovirus, enterovirus, and a bunch of other winter related respiratory viruses. And as a result, we will have less severe illnesses, less community acquired pneumonia, and overall there'll be less patients with respiratory illnesses which will give us again more flexibility to take care of the corona cases, then allocate those resources for the seasonal respiratory viruses.

DANNY LENNON: All those things you mentioned around the benefits to flattening the curve being

numerous, and I think a lot of them boil down to a phrase I think I heard Dr. Peter Attia mention in a video recently where he used the phrase, we are essentially buying time. And I think particularly now when so much of this is uncertain trying to get people to engage in things even though we don't know exactly how everything will play out, as you've outlined that the more time we buy by flatting that curve in keeping the healthcare system within capacity, the more time that goes on, we are getting more of this data in, we're getting more access to learn about this virus, and then potentially even the further it gets down the road we can start thinking about drugs and so on. What current state are we with that, by the way in terms of drugs that can potentially be developed? Is there anything that is looking promising or what might that process from here going in the months ahead look like?

RIZWAN SOHAIL: Yeah, so there are currently clinical trial going on and previously some data coming from China on what they've tried. The most promising drug at the moment seems to be this drug called Remdesivir from the company Gilead. And this drug was originally developed to fight Ebola virus, but in vitro and in animal models seem to have activity against the SARS coronavirus and the MERS coronavirus as well. One of the difficult things about assessing the benefit of this drug is that because it's in limited supply and, as I said, in animal models, it seems to work both in terms of it prevents the viral replication from happening and then also limits the damage that it does, but currently it's being used primarily in severe cases, not for mild to moderate cases or in the early phase of the illness where it may be the most beneficial, but we just don't have enough that it can be used at that stages. So that makes me a little bit nervous about how the trial data will look like because we're using it in patients where most of the damage has already been done and they're in ICU and on a ventilator where the benefit mostly will be supportive

care rather than the antiviral benefit at that moment, but it's something that we will see.

Then also from China there's data about chloroquine used as most people would know it's anti-malarial drug which seems to have activity against this SARS coronavirus. It interferes with how the virus tries to replicate inside the cells by causing cellular acidification. And so the couple of studies that are reported in China seems to suggest that this may be a beneficial drug, and because it's much more widely available, being an anti-malarial drug, I think that may hold quite a bit of promise. Then there are a bunch of other experimental areas as well. There are anti-immune system medications, immunomodulators one of them, it's class of drugs called IL-6 blockers, and these are the drugs that have been used in other situations. So for instance, in our patients who were getting cancer therapy with some modified T cells called CAR-T therapy, they tend to get the cytokine storm and the IL-6 blockers seem to work in those. And so there's kind of hope that the IL-6 blockers which are part of the Chinese guidelines actually now, how to treat severe virus, may help to block the inflammatory response, the cytokine storm that happened in these patients. And then there's a lot of things, a laundry list of other drugs, many of them are antivirals which are used for influenza or especially the HIV medications. It's too early to tell how many of those would be beneficial in this epidemic, but there's certainly a lot of interest in investigating those.

DANNY LENNON: I want to turn to the, I suppose, the response that's essentially needed now, and I think there's two separate ways that we'll have to address this: one, from a public health, governmental perspective of that response that's required; and then secondly, it's going to be related but separate in terms of individuals and their response and that will probably be context dependent. So first, if we take the public health government response to this, this is obviously going to be, again vary by

jurisdiction and wherever listeners are that will depend that will depend on what we're looking at here. And so far we've seen, at least as of today, March 17th, there's very different responses in different place in terms of the restrictions. Could you maybe give some clarity over maybe some of the typical terms people are hearing in terms of the different phases that may be used in a public health response to a pandemic, people hear things like a mitigation phase or containment or active suppression, what are these different phases or what are some of the common different strategies or phases that are looked at when controlling pandemics more generally, and then obviously in this case too?

RIZWAN SOHAIL: Yes, so in general, in an ideal world, one would stop the spread of the virus altogether. However, in this particular case of the SARS coronavirus, we've already passed that point where it has spread to most countries around the globe already. So we are really into that phase, the mitigation phase, we are trying to limit the impact of that. And from a government perspective, I think the biggest things to do are limit the larger gatherings of people in one places, and so from that perspective the governments need to put some restrictions on how many people can gather at one place, then provide incentives to businesses or support them, so they're willing to close down for a few weeks, especially in this phase when we are trying to flatten the curve. Then a lot of people are worried job securities and the paycheck, because the reality is that people need to work to make a living, and therefore even when they have milder illness, they tend to go to the work. So at the government level, the government needs to kind of provide some kind of support to these folks so they are able to stay at home. One of the unfortunate things that we are witnessing these days is that there is a lack of trust in a lot of countries between the governments and the population which is just making things worse. And similarly, unfortunately, there's a lot of

mistrust between the information available on the internet and the news channels and the general population as well. So I think the government needs to kind of restore some bit of trust between the population, so people kind of listen to their advice. This is really where the focus needs to be.

Now, another big thing about return to work is this ability to test, and this is where I think, especially here in the United States, we feel that we are way behind the curve, because if the testing was widely available and easily done through the drive-through testing, then in patience, in people who have minimal symptoms, may be due to some other respiratory virus or they're not affected at all, one could test them in the morning, call them with the results later that day or next morning, and if they're clear, they could return to work, especially if they're in settings which are not, you know, have large gatherings, but unfortunately due to limited availability of testing that's been a one big problem in containment that we can't really tell people if they're infected or not, we are just generally advising people to self-quarantine after an exposure, and that's been a difficult thing to do.

DANNY LENNON: Yeah, there's, like I said, there's so much going on, at least here where I'm currently, I'm in Ireland – there seems to be different restrictions compared to some other places and testing is hopefully ramping up this week as well, and there has been a big push towards contact tracing as well, which again in some places is better, some places worse. But I think if we turn our attention to individuals in this context from again a broad public health perspective, we have those kind of clear guidelines of around social distancing, hand-washing, minimizing social contacts and so on. Now, given that at an individual level for people listening to this, some are in a position where they will have to still go to work – we have many healthcare professionals, we have people that work in supermarkets, people that

are involved in delivery within the supply chain, etc., people who are working within public transport. So many people that still have to do that and people will have to be going out and about and that can still be achieved with this general idea of social distancing, however, for people that are in some ways a luckier position to be able to make choices about how much they choose to go out, would it, from an individual perspective, be even better to go beyond the general social distancing guidelines to more of a self-isolation as much as possible, and what would that do at a broader public level, how much of an impact could that or could it not have if that makes sense?

RIZWAN SOHAIL: There are two groups of the individuals which we are thinking about at risk, and one is that obviously high risk, age above 60 or especially age about 80 where the mortality seems to be even 10% or higher. So if people who are retired and not actively working, I think especially for them it's very important to just avoid large gatherings at this time and, as I said before, not going to places of worship for the next few weeks until the epidemic seems to slow down, restaurants, bars, cinemas, places like that. Any working individual who has to work but has the option to do remote work, especially a lot of the office working, can be done remotely through internet so that those individuals will stay at home. There's a huge effort to deliver learning online which is really important for the schools and colleges, because that group of population, the kids, and the adolescents, and the young adults, which are in elementary schools, high schools, colleges, they themselves are unlikely to get severe illness. However, they can certainly bring it home or the vehicles of spread in the community. So I think the institutions of learning will have to figure out in the next few weeks how to best deliver online learning – on such a mass scale, it has not been done before, and I don't think a lot of people have a lot of experience in it, but that's something that they have to try to figure out in the next two-three weeks, because if

you're successful in flattening the curve, that would still mean that it will be months before we can restore a sense of normalcy. Hand-washing has been promoted a lot and for good reasons because the soap tends to disrupt the outer envelope of the virus and disintegrating the virus is really helpful. People should avoid touching the face and eyes, and I see the news conferences and politicians and kind of makes me cringe when I still see them shaking their hands, and I think this is something that needs to change for the next few weeks.

And I think the other, again, people just need to learn and adapt to some new lifestyles for the next few months honestly. There has to be a sense of equity and solidarity in communities and populations. People need to listen to the trusted sources of news, avoid the fear and the rumors which are going on, on social media and some news channels unfortunately, and just need to stick together because we need to remember that we are trying to minimize exposure and prevent deaths in the most vulnerable members of our community, our grandparents, our parents, and from healthcare workers, our patients with multiple co-morbid conditions. So this is not the time for younger individuals who are otherwise at a very low risk of serious illness to be selfish. I think it's time to rise above the usual state of mind and think bigger and broader and be kind and have compassion.

DANNY LENNON: Even if all of that about just having some morals and being willing to make some, in the grand scheme of things, relatively small sacrifices in terms of how much help you will have in terms of saving people's lives, literally, and even extends beyond that, if you are in a place where people don't end up sticking to some of these guidelines and healthcare systems do get overrun not only are you then going to see basically a crash of that healthcare system, the untold impact that will have on all those healthcare professionals that have to work within that for the time being, in addition

to all the death that we'll see, that is going to have catastrophic knock-on effects on everyone else's life outside of that economically and everything else. So there's just every reason you can imagine to be able to continue to work together on this, and I think, as you say, the thing that's probably most important around this solidarity is that these things only work not with one or two people doing it, when everyone does it, that's when the big impact happens. And obviously, situations vary around the world, but in terms of the US right now, what you've seen of the response so far, the current plans that are in place and where the estimates put cases that are in the US right now, where are you currently thinking or what this may unfold and look like over time, how optimistic or pessimistic are you about what the next couple of months have in mind?

RIZWAN SOHAIL: Based on where we are right now, if the trajectory continues the way it is, then I think we're in it for a long haul, I think the outbreak will continue for next several months, and we could potentially see hundreds and thousands of cases of coronavirus infection. And with even the best estimates of mortality of 0.5% that can be quite a few patients. Now, if the mitigation strategies that the government is trying to do, and especially in the last like four or five days, if people follow that, I think we could be in a much better situation. There are some early signs which make me optimistic that in the last couple of days I've been going around in and around town and seeing that people have taken things in their own hands, even without the government lockdowns and curfews or anything like that, I see a lot of streets now which are deserted, not many people are congregating together, the religious community is also coming together and advising very the followers to kind of stay home and pray at home. So I think there are reasons to be optimistic that the message is getting through. People are more aware, they are beginning to follow social distancing recommendations; the testing is becoming much more robust in the

last, especially last seven to 10 days, multiple labs have developed their own in-house assays including our own lab here at Mayo Clinic. So I think, and I'm also eternally an optimistic person to begin with, so I am hopeful that we can slow it down, we can reduce the number of deaths, and we can really get through it, though it will be a difficult time and it won't end very soon, and we may just have to get used to a new way of living for the next few months.

DANNY LENNON: Yeah, thank you. Before we finish, is there anything that we didn't get to that you think would be important to point out or any kind of final message or takeaway point you would like to leave people listening with?

RIZWAN SOHAIL: No, I think one thing that really struck me when I looked at the statistics number this morning, in the New York Times, is that in the last 48 hours, there's only one case of coronavirus reported from the whole of China, and that is really amazing. So I think that while we are all scared that this could be the worst pandemic in the last century, it gives me hope and optimism that the mitigation strategies and containment can work. I mean, China being the epicenter of this outbreak and most of the deaths were reported in China as well, out of the 7000 plus deaths, 3000 were reported from China – but the fact that we are almost seeing the tail end of the severe epidemic, I'm sure some local transmission will continue for a while, even there, is really I think gives me hope that we can contain it and we can't stop it if you just get together. Now, obviously the mitigation strategies that China put together were very strict and some people would call it harsh, but even if you can't do it to that point, but doing whatever we can do, there is reason for optimism.

DANNY LENNON: Right. I think, yeah, the earlier those happen the better, because I think in terms of the lockdown that happened around Wuhan and, we've obviously seen now, Italy and Spain enforced lockdowns, other countries have

something not as stringent but getting close to what might look like a lockdown, but at least I think the small bit of light for the countries that are lagging behind some of those have been most severely affected is at least they have some sort of blueprint to go with or at least we'll start to see more of that data emerge of what might be possible giving certain measures. So yeah, see how that pans out, but it's definitely going to be uncertain times. So with that, Dr. Sohail, I want to say thank you so much for giving up your time today. If people want to find out more about your work or keep up-to-date with what you're doing, where can they find you on social media or on the internet or anywhere that you'd like to direct their attention?

RIZWAN SOHAIL: Yeah, I mean, they can find me on Twitter, but I think I would recommend that this rapidly changing epidemic and new data coming in everyday, people should really go to either CDC website or WHO website, they have a lot of good information. And then we, at Mayo Clinic, also has a website dedicated to coronavirus, so people can just Google Mayo Clinic and coronavirus and they'll be able to get to that site and there's a lot of resources for general public to look at, there are videos there, and then news articles about prevention, etc. which I think will be very helpful. And then I am on Twitter.

DANNY LENNON: Yeah, 100%, and for everyone listening, I will link up to all of those sites and Dr. Sohail's Twitter in the show notes to this episode which you'll be able to check out and keep up-to-date with everything. So with that Dr. Sohail, let me again say, thank you so much for giving up so much time today, especially given how busy and crazy things are at the moment and for all the work you're doing and what you've been able to share with us today, it's very much appreciated.

RIZWAN SOHAIL: My pleasure, thank you for having me.