COVID-19 In and Out of Hospitals, Atlanta, Georgia

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hello, I'm Sarah Gregory, and today I'm talking with Dr. Kristen Pettrone. She's an Epidemic Intelligence Service officer at CDC. We'll be discussing the characteristics of hospitalized and nonhospitalized patients with COVID-19 in Atlanta.

Welcome, Dr. Pettrone.

[Kristen Pettrone] Hi, thank you Sarah for having me.

[Sarah Gregory] So, COVID-19 has become, of course, instantly recognizable to everyone as the name of this pandemic. I'm not sure how many people remember what it stands for. As you know, it actually means something pretty simple—coronavirus, infectious disease, and the 19 refers to the year it emerged. I remember the early days when the virus didn't have a name yet. How is the name decided on, and in this case, who chose it? Was it CDC or WHO or an international committee, or what?

[Kristen Pettrone] That's a good question, Sarah. As you said, COVID-19 is an abbreviation of the name coronavirus disease 19 for the year it was discovered (2019). This name was actually chosen by the World Health Organization, and it was announced in February of last year. And the name has obviously been adopted all over the world, including here in the United States.

[Sarah Gregory] So, just take a quick moment to explain the difference between COVID-19 and SARS-2. We sometimes see SARS-2 also.

[Kristen Pettrone] So, SARS-CoV-2 is the naming of the virus that causes coronavirus disease. So when we refer to COVID-19, we're generally referring to the disease itself, kind of like the constellation of illnesses caused by this virus SARS-CoV-2.

[Sarah Gregory] Okay. So, your study uses data from March and April 2020, the early days of the pandemic. Could you describe what you were doing in your role as an EIS officer at that time and what was the mood like?

[Kristen Pettrone] So, when I was an Epidemic Intelligence Service officer early in the course of the pandemic, I deployed with the Epidemiology Task Force of the CDC COVID-19 response. As an EIS officer (or Epidemic Intelligence Service officer), we can deploy with multiple aspects of the response in addition to our kind of regular duties with the fellowship. So while I was deployed with the Epidemiology Task Force, we were moving forward with this study. And so, I reviewed the medical records of the nonhospitalized patients and then I abstracted information from those medical records into a database. I was able to analyze the data from both the hospitalized and the nonhospitalized patients and then be able to put some of the findings together in this publication.

I think for me, the mood was very excited. It was relatively early in my Epidemic Intelligence Service fellowship, so I was really excited to be doing some of this work. But I think I was a little apprehensive about the trajectory of the pandemic, and then what we might find with our investigation.

[Sarah Gregory] Yeah, what you found wasn't so happy anymore, right?

[Kristen Pettrone] Right.

[Sarah Gregory] Your study was investigated in Atlanta, Georgia, where the CDC is based. Give us a bit of background on how COVID-19 first emerged in the city and how it's played out since then.

[Kristen Pettrone] Well, I think the COVID pandemic emerged in and has kind of played out in Atlanta very similar to how it has throughout the rest of the country. Like many states, the COVID pandemic emerged in Georgia in March of last year. Georgia experienced peaks in the summer of 2020 and then again in the winter of 2020 and 2021. Georgia did declare a public health emergency in mid-March and implemented measures to try and limit the spread of the virus, like wearing masks, limiting the number of people at social gatherings and issuing stay-at-home orders. And then Georgia began vaccinating for COVID in December of last year, and recently vaccination has actually been opened up for everybody over the age of 16 in the state.

[Sarah Gregory] Since your study is based on information from a year ago (or approximately a year ago), how is that useful now?

[Kristen Pettrone] Yeah, that's a good question, Sarah. I think many of the characteristics of COVID that we evaluated in our study—such as how long the symptoms last, risk factors that might put an individual at risk for more severe disease, medical conditions that also might put them at higher risk for developing severe disease from COVID—are not likely to change. Also, similarly, how well these conditions are controlled in individuals are not likely to change significantly. So, these finding will still be useful I think and applicable even now.

The findings from the study can also be used to generate new hypotheses for future studies or to prompt similar studies involving multiple sites, because as you know our site (our investigation) took place in Atlanta. So I think a lot of the things that we looked at and a lot of the issues and risk factors that we tried to identify are things that are going to be consistent and still stay prevalent during the pandemic even with the emergence of variants that we're seeing now.

[Sarah Gregory] Why are patients with conditions like diabetes, hypertension, or particularly obesity more likely to have severe COVID-19? They’re not like asthma, which clearly affects the lungs.

[Kristen Pettrone] Right. I know everybody has heard how significant and devastating COVID can be, causing people to have difficulty breathing, and that does affect the lungs. But we are seeing people who have conditions like hypertension, diabetes, and obesity more likely to develop severe COVID disease. And the exact mechanism that causes this higher risk is not really known. It is thought that an impaired or weakened immune system due to these conditions or the inflammation in the body that occurs as a result of hypertension, diabetes, and obesity is what really contributes to this increased risk of severe outcomes from COVID: hospitalization, need for ICU admission, and even death.

[Sarah Gregory] So why is asthma not considered a risk factor? I have asthma, so I was astounded when it wasn't on the list.

[Kristen Pettrone] Other studies have definitely identified asthma as a risk factor for severe COVID infection. Unfortunately, in our study we really did not have enough patients that had asthma to be able to evaluate this condition as a risk factor. So even though we didn't list it as a risk factor, there are definitely other studies that have identified asthma as a risk factor for severe COVID infection.

[Sarah Gregory] Okay. Well, that makes more sense to me. Doesn't make me feel better, but it makes more sense.

You analyzed whether patients with controlled hypertension were less likely to be hospitalized than patients with uncontrolled hypertension. How did you define “control” and what did you find?

[Kristen Pettrone] Well, we tried to use...that's a good question. So, we tried to use the information that was available from the medical chart. So, we were able to identify the number of medications a person with hypertension (or a person who was identified as high blood pressure) how many medications for high blood pressure they were taking. And we decided to use this as a marker for how severe their high blood pressure was or how well their hypertension or high blood pressure was controlled. We found that patients who were taking 3 medications for high blood pressure (3 or more medications for high blood pressure), were at higher risk for hospitalization with COVID infection compared to those patients who have hypertension who were only taking 1 medication or even no medications.

[Sarah Gregory] So, hypertension often goes along with obesity. How were you able to separate that out?

[Kristen Pettrone] It was difficult. We were able to control, and when we did our analysis we were able to do what was called 'control for other risk factors.' Because you're right, it's very frequently patients who have high blood pressure often have other conditions like diabetes and obesity. And we were able to control for these other things (the diabetes and obesity) when we were looking specifically at those who had high blood pressure and the number of medications that they were taking. Almost in essence kind of taking that out of the analysis and balancing it between both groups so we could really focus on how much of a risk there was in those patients with high blood pressure, to be able to look at the number of medications they were taking and whether that affected their risk of hospitalization.

[Sarah Gregory] You carried out a similar analysis for patients with diabetes, but you looked at a molecule called hemoglobin A1c. What is that, and did it end up having any relationship with whether a diabetic person would be hospitalized?

[Kristen Pettrone] Right. So, hemoglobin A1c is a measure of how much glucose or sugar is attached to our red blood cells. It's a very useful test for patients with diabetes or for diagnosing diabetes because it measures an average of the amount of glucose or sugar on red blood cells over the last 3 months. So it is commonly used by doctors and healthcare providers to estimate how well the diabetes is controlled in a patient, and whether or not the patient has diabetes. So in our study, we found that patients who had diabetes who had a hemoglobin A1c greater than seven, and we chose this level because it is a common cutoff (it's listed on the CDC website, the American Diabetes Association); it's a common value for estimating adequate versus poor control of diabetes. And we found that patients with diabetes who had a hemoglobin A1c (a higher hemoglobin A1c) greater than seven percent were approximately four times more likely to require hospitalization with COVID infection compared to those patients who had diabetes and a hemoglobin A1c less than seven percent.

[Sarah Gregory] We sort of touched on this already, but how does having more than one underlying condition affect your risk for COVID?

[Kristen Pettrone] Right. We found that there was a direct relationship between the number of underlying medical conditions (also known as comorbidities) and the risk of hospitalization. So, patients with two underlying medical conditions were approximately two times more likely to require hospitalization than those patients with no underlying medical conditions. And then those patients with three or more underlying medical conditions (or also known as comorbidities) were four times more likely to be hospitalized. So we did find this direct kind of stepwise increase with the risk of needing hospitalization from COVID infection and the number of conditions or medical conditions that a patient has.

[Sarah Gregory] What were the most common symptoms among hospitalized versus nonhospitalized patients?

[Kristen Pettrone] Like many studies have reported and that I think most people are familiar with, we did find that cough and fever and muscle aches and fatigue were the most common symptoms in the nonhospitalized patients. We found that upper respiratory symptoms like nasal congestion or runny nose, sore throat, were more common in the nonhospitalized patients whereas shortness of breath was actually more common in the hospitalized group.

[Sarah Gregory] You also looked at whether a patient's symptoms lasted more than 21 days. Would those patients be considered what we call long haulers now?

[Kristen Pettrone] You know Sarah, that's tough to say. The definition of the long-hauler is definitely evolving. I think, in general and right now, it refers to patients who have recovered from their acute COVID infection and are still experiencing symptoms weeks to even months after testing positive for the disease. Even though we found that almost 50% of the nonhospitalized patients in our study had symptoms that lasted longer than three weeks, it's really difficult to say if these were actually long haulers. We didn't look beyond the 21 days, and we really didn't design this study to look for long haul syndrome or long haulers. So, it's tough to say if those patients who had symptoms longer than 21 days in our study actually ended up or turned out to be long haulers.

[Sarah Gregory] I see, okay. So did symptom length have any effect on the outcomes you studied?

[Kristen Pettrone] We tried to look at that, but we really were not able to look at the differences in symptom lengths between hospitalized and nonhospitalized patients. You know, patients who are admitted to the hospital may have had symptoms obviously before going into the hospital, but once they are admitted to the hospital are likely going to be receiving, you know, therapies and medications to alleviate their symptoms. So, it is difficult to do a direct comparison between duration of symptoms between hospitalized and nonhospitalized patients just because the therapies that they're receiving are very different. And some modalities that might be given in the hospital might blunt the symptoms and make it difficult to really do that direct comparison about how long they last between those that have more severe disease and those that do not.

[Sarah Gregory] You also studied the different types of treatment people initially sought. What were the different types, and what did you find and when did people seek them out?

[Kristen Pettrone] We really looked at care-seeking behavior in the nonhospitalized patients. We were very interested to see, you know, how they entered the healthcare system, how many interactions they had with the healthcare system. Interestingly, found that 85% of our nonhospitalized patients sought in-person care, meaning he went to a provider (physically went to a provider), so that would be a visit to the doctor's office or a visit to the emergency department or urgent care clinic. Eighty-five percent of our nonhospitalized patients were seen in-person a single time for their COVID illness. We looked at all the healthcare visits among the nonhospitalized patients and found that the second most common type of healthcare visit for their COVID illness was actually a telehealth visit, and that among those patients who had symptoms lasting longer than three weeks (those ones with longer symptom duration) telehealth was the most common type of visit that these individuals participated in for their care for COVID.

We do have to acknowledge though that this information was, we only used the information that was available at the time we abstracted the medical records. So, it is possible that patients may have had

other additional visits beyond the investigation period, but we did think it was very interesting to note that a large percentage of our nonhospitalized patients were seen a single time for their COVID illness and that telehealth really played a very key role in the care of all the nonhospitalized patients, but also in particular those who had symptoms that lasted greater than 21 days.

[Sarah Gregory] Why don't you give us the highlights of your study now and tell us what the goal was.

[Kristen Pettrone] The goals of our study were really two-fold. First, we wanted to describe some of the key characteristics in the nonhospitalized patients. Up until that point, there had really been a lot of focus on, you know, what drives people to (or what causes people to) need to be admitted to the hospital or what may be causing and playing into more severe disease for COVID. So, we really wanted to take a little bit of a deeper dive into the nonhospitalized patients. We wanted to (as I said before) look at some of the care-seeking behavior—you know, how often and where these patients were getting their care, how long they were having symptoms, and what kind of symptoms these nonhospitalized patients were having. And as we talked about earlier, we found that most patients that did not require hospitalization were seen a single time either in-person by a primary care provider or via a telehealth visit for their COVID illness, and that symptoms lasting longer than three weeks were actually quite common in the nonhospitalized group.

The other goal of our study was we wanted to explore in more detail some of the known risk factors for COVID. Again, a lot of interest had focused on what were the risk factors, but we wanted to look at things in a little bit more detail, like breaking down age into some kind of smaller age categories, and looking at combinations of underlying medical conditions, and again the question of how well these conditions were controlled in patients—whether that contributed to the risk of hospitalization. And also again, we looked at how having multiple underlying medical conditions or comorbidities played into the patient's risk of needing hospitalization. And we found again that increasing age, and as we talked about earlier, increasing number of underlying medical conditions or comorbidities resulted in this stepwise increase in the likelihood of being hospitalized for COVID. And then we also found this correlation between degree of control of high blood pressure and diabetes and the increased risk of hospitalization.

[Sarah Gregory] We touched on this before, but elaborate if you can a little bit on how your Atlanta findings are generalizable to the rest of the country and the world?

[Kristen Pettrone] That's a good question. You know, it's difficult to generalize our findings to the rest of the country or to the world. As I said, I think risk factors are something that are going to be present everywhere. But it's important to keep in mind that we studied a group of patients from a very set time period (March and April of last year) presenting to a single hospital system in one city in the United States. And this population may not mirror and it may not be identical to populations in other areas of the country and in the world. There are definitely important other factors to consider when we talk about risk of hospitalization or risk factors or risk of severe disease from COVID that may be different from our population and other populations. You know, things like access to medical care or cultural differences or differences in socioeconomic status really can play into the severity of disease or the ability to get care for COVID that may not be generalizable from the Atlanta area to other areas of the country or even to the world.

[Sarah Gregory] You mentioned telemedicine and how people generally in the 21 days if they had COVID just had one visit. But tell us more about how telemedicine has risen in popularity during the pandemic and what (in the broad scheme of things) has its role been in treating patients with COVID-19?

[Kristen Pettrone] I think telemedicine, as I said, has played a key role in healthcare delivery during the pandemic and some of it has been driven by necessity. It has provided access to healthcare providers for patients at the same time protecting both the patients and the healthcare provider. And I think telemedicine as being useful for treating patients with COVID, but also equally importantly has been useful in patients to treat other conditions or allowing patients to continue their routine primary care. And we suggested in the study maintaining good control of underlying medical conditions could possibly lower your risk of hospitalization with COVID-19. And so telemedicine I think has played an important role in accomplishing this in continuing to facilitate the healthcare provider and patient interactions while at the same time maintaining safety of both the patient and the provider.

[Sarah Gregory] I keep going back to this, but in general, if you think you might have COVID, when should you go to the ER versus an outpatient or telemedicine appointment?

[Kristen Pettrone] So the CDC actually has a lot of useful information on their website for people to help decide if they have symptoms and where they might need to go get care or get testing. In general, if you have a healthy immune system and are experiencing mild symptoms like cough or loss of taste and smell, a runny nose, then it is appropriate to contact your primary care provider for a visit or a telemedicine visit. On the other hand, if you are experiencing any life-threatening symptoms such as difficulty breathing or chest pain or you're witnessing somebody who is having a decreased level of consciousness, then it is important to go to the emergency room.

[Sarah Gregory] Were there any findings that actually surprised you?

[Kristen Pettrone] One of the more interesting findings from our study was the percentage of nonhospitalized patients that had symptoms lasting longer than three weeks. And also, interestingly, that the majority of these patients were managed or sought care a single time from a healthcare provider. This does suggest that a lot of nonhospitalized patients are able to manage their symptoms on their own—again, only with a single interaction with a healthcare provider—even though they might be experiencing symptoms for longer than several weeks.

[Sarah Gregory] Were there any particular challenges in doing this study?

[Kristen Pettrone] I think one of the biggest challenges was setting up the study. We really would not have been able to perform the analysis and present these findings if we didn't have the support and the cooperation from the healthcare system, who provided access to the medical records and testing information, as well as the cooperation from the state and local health departments. This cooperation between CDC and local jurisdictions is something that has occurred repeatedly during this pandemic, and I really think has provided some key information that has informed much of our public health responses to COVID and to the pandemic in general. So, it really has been great to see this cooperation between multiple different organizations working together towards a common goal. And that is one of the things that happened when we set up our study and really could not have...the study could not have taken place if we didn't have that cooperative effort.

[Sarah Gregory] So speaking of studies, are there any other CDC COVID studies planned that you want to mention that you're part of? There is still so much we don’t know.

[Kristen Pettrone] Yes, there still is a lot we don't know. And with the evolving pandemic and as more and more information becomes available, more and more questions get asked. So, there are lots of...there are many, many studies planned and ongoing with CDC, particularly looking at these variants of interest and transmission, with the goal to helping us better understand this disease and how to combat it. So,

yes, there are multiple studies ongoing, both looking at some of these risk factors and care-seeking, as well as, you know, mitigation measures to try and curb the spread.

[Sarah Gregory] And you mentioned variants, studying how the variants are affected by the vaccine, no?

[Kristen Pettrone] Yes, absolutely.

[Sarah Gregory] As we know all too well, COVID is still killing lots of people and certainly making lots of people very sick. But more and more people are starting to ignore it. What are your thoughts on this?

[Kristen Pettrone] I think COVID fatigue and lockdown fatigue is something that's real. I think it's easy to become more casual in our adherence to mitigation measures, like social distancing and mask wearing and handwashing. I think it's particularly hard as the weather gets warmer, and also we hear about more people getting vaccinated. But it is important to remember that COVID is still out there and it is killing people, and that simple measures like mask wearing and handwashing and social distancing and getting vaccinated can save not only your life, but the lives of others as well.

[Sarah Gregory] What is something you think every person should know about COVID?

[Kristen Pettrone] I think asymptomatic spread is the one thing everyone should know and probably has heard about, but it's always good to remind people about COVID. So even though you may not have any symptoms or even be aware that you're infected with COVID, you can still spread the virus. And the next person who gets the infection from you may not have the same mild symptoms. They could end up in the hospital, they could end up on a ventilator, or even worse. And this is why I think it's so important not to become lax in our efforts to stop the spread of the virus, and be constantly aware and reminded that asymptomatic spread is something that is still happening during this pandemic. And again, even though you may not have symptoms, you can spread the virus to somebody else who could really be significantly affected by COVID infection.

[Sarah Gregory] Tell us about your job at CDC. What you like most about it, what you do, what your background is.

[Kristen Pettrone] So I am a second-year Epidemic Intelligence Service officer. My background is I'm an emergency physician. I practiced for a number of years before joining the Epidemic Intelligence Service. EIS, or the Epidemic Intelligence Service, is a two-year applied epidemiology fellowship (or training program) with the Centers for Disease Control and Prevention. We like that we've been called disease detectives. What I like most about EIS is the opportunity to get involved in so many different aspects of CDC. Obviously, most of my training has been with COVID, but before the pandemic (the COVID-19 pandemic), I was involved in the Ebola and polio responses. I've been able to travel to other states, I've been able to travel to other countries to support these efforts. I have learned new skills in each of these deployments. I've been able to work alongside some really incredible and dedicated people who have been mentors and taught me an unbelievable amount of information and I like knowing that I have contributed even a small part to this massive global effort to combat these diseases. So, that's really what has been my favorite part of EIS so far.

[Sarah Gregory] I think EIS officers are what everybody think of as CDC. That's what everybody does at CDC. It's like the dream job in the movies and everything.

[Kristen Pettrone] I like it. And I think EIS is well-known amongst CDC, so you know CDC staffers will really look out for us and put opportunities sort of in front of us that we can really seize on. I think it's almost the best of the best, you get to have your cake and eat it too, you get to pick all of the things that

you would be interested in, you get to work hard, you get to learn whole new aspects of a public health response and new skills in each step and each deployment and each activity you get involved in.

[Sarah Gregory] CDC has a lot of high-profile, important scientists that started out as EIS officers. Do you hope to stay here? Or are you going to take this knowledge and try something new after your program's over?

[Kristen Pettrone] I'm still trying to find that out right now, Sarah. But I really would hope to stay with CDC. I think it's a great place to work. I think the work is just so important, and I love to be involved in it. So, it really is my hope to stay with CDC, and I hope to take some of the skills that I've learned with EIS and then some of my clinical skills that I have from, you know, working as an emergency physician and combine those two in my continued work with the CDC.

[Sarah Gregory] If you have any free time, how have you been spending it this last year? Most people at CDC, unless deployed to COVID or another outbreak, are still working from home. How has that worked for you, and what are you doing?

[Kristen Pettrone] I've been able...well, thankfully I've been able to do a combination of field deployments and telework during the COVID pandemic. So, taking field deployments, again, I've traveled all over the country to help state and local jurisdictions with their COVID response, I'm currently working with the vaccine safety team. So between deploying to the field and then doing telework from home, it's been pretty busy. It is nice to be home when I'm teleworking with my children during the pandemic. It has been challenging to try and meet their needs, particularly with remote learning on top of working in kind of the fast pace of the COVID response. But I think like everybody else, we've made it work. Everybody is pitching in, everybody is helping out and everybody is making adjustments. When I do have some free time, I like to bike, I like to play my cello (although my family says I sound terrible when I do it). But those are things I like to do in some of my free time. It really has been an interesting and challenging year. But, as I said, I've had some amazing opportunities and I have really learned an incredible amount with my time at EIS and with CDC.

[Sarah Gregory] Well thank you for taking the time to talk with me today in your very busy life, Dr. Pettrone.

[Kristen Pettrone] Thank you, Sarah. Thanks for having me.

[Sarah Gregory] And thanks for joining me out there. You can read the April 2021 article, Characteristics and Risk Factors of Hospitalized and Nonhospitalized COVID-19 Patients, Atlanta, Georgia, USA, March–April 2020, online at cdc.gov/eid.

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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