

What doctors want patients to know about which COVID-19 test is best

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Polymerase chain reaction (PCR) tests. Antigen tests. Genomic tests. Antibody tests. At-home tests. It can all seem overwhelming to patients already stressed by the many hard decisions entailed by living through a once-in-a-lifetime pandemic.

There are two main types of tests: viral tests and antibody tests. A viral test tells you if you have a current infection and it includes PCR and antigen tests. An antibody or serology test might tell you if you had a past infection and should not be used to diagnose a current infection.

Widespread testing with quick turnaround times is needed—along with vaccination, wearing a mask, physically distancing and washing hands—to effectively control the COVID-19 pandemic. But with several different types of COVID-19 tests on the market today, it has left many wondering when they should get tested and which test is most appropriate. One pathologist helps clear up some of the confusion around COVID-19 testing.

The AMA's What Doctors Want Patients to Know™ series provides physicians with a platform to share what they want patients to understand about today's health care headlines, especially throughout the COVID-19 pandemic.

For this installment, AMA member Scott Koepsell, MD, PhD, took time to discuss what patients need to know about COVID-19 testing. Dr. Koepsell is a [pathologist](#) and vice chair for clinical operations at Nebraska Medicine in Omaha. He was also instrumental in setting up testing for COVID-19 at the University of Nebraska and for multiple sports teams around the region, including the Nebraska Cornhuskers.

COVID-19 testing remains important

Testing has served many important purposes during the pandemic, Dr. Koepsell explained. “Testing served to keep our patients safe when they got admitted to the hospital by keeping COVID-19 patients away from patients without it.

“Testing also served the role of keeping our staff safe and it continues to play a big role in that because we don’t want to be doing invasive procedures on patients without knowing if they have COVID or not,” he added. “And then as far as what is causing problems in very sick patients, is it COVID or something else?”

“It’s an important part of the algorithm for keeping everybody safe in conjunction with vaccination,” said Dr. Koepsell. While “testing continues to play a major role, as more people are vaccinated, the role is changing.”

There are many reasons to get tested

“The recommendations for testing get updated routinely and it really depends on your local and state laws as well as your institutional policies,” Dr. Koepsell said. “It really depends on what type of work you’re doing and what situation you’re in.”

“There’s a wide variety of reasons to get tested. If you’ve been exposed, perhaps maybe you have travel coming up or you’re going to be around somebody who is more susceptible, you may want to get tested,” he added. “But it really depends on why. People have to look up their own local guidelines and recommendations depending on where they live. And those are not static. They just keep getting updated and switched around.”

“One of the unfortunate things is that as we learn more, recommendations get updated and people can still test positive if they’ve been vaccinated,” he said.

Read about [what doctors want patients to know about breakthrough COVID infections](https://patients.ama-assn.org/public-health/infectious-diseases/what-doctors-want-patients-know-about-which-covid-19-test-best).

Genomic tests are sensitive

“We have two broad categories of tests. One is the test that looks for the genomic part of the virus—the RNA—and that test is very, very sensitive and typically is done in a hospital laboratory” like a PCR test, said Dr. Koepsell. “However, it is now also available on smaller platforms that can be at your local doctor’s office or maybe a community group like an opera or a sports team might even have access to them.”

“For the genomic test, we can have tests available fairly rapidly—within an hour—in some circumstances,” he added, noting that “it is a lot more sensitive, and it can pick up lower levels of the virus.”

Antigen tests are quick

“The other group of tests is looking for the proteins of the virus and those are called antigen tests,” said Dr. Koepsell. “Those have been a lot easier to use at the point of care ... and they’re even for sale for use at home.”

“To look for the protein of the virus, the antigen tests function a lot like a home pregnancy test,” he explained. “They’re just looking for whether it’s having one line or two lines on a test strip—is that protein there and are we able to detect it, meaning is the virus there and are we able to detect it?”

“So, they’re fast, they’re readily available and they’re even available for home-care use now,” Dr. Koepsell added, noting that “the antigen tests can be done in as little as a few minutes. But being faster doesn’t mean it’s better. It just means that you get the result out faster and quicker.”

It is important to note that, depending on the situation, antigen tests can be less accurate than PCR tests. For example, when a person is in the early stages of infection, not a lot of the virus is in the nose and throat where samples are taken. This can cause antigen tests to miss early cases of COVID-19. It is also during this stage that a person has no symptoms, so they are more likely to be unaware they are infected.

At-home tests must be done correctly

Now that at-home COVID-19 tests have become more readily available on store shelves, it is important that they are performed properly, explained Dr. Koepsell. “Whether it’s testing for the genomic material or looking for the antigen of the virus, both involve typically putting a swab up your nose.

“There are other saliva-based tests out there too, but the one where you put the swab up your nose can be very uncomfortable,” he added. “And the ones that go into the back of your throat can be very uncomfortable, so if you’re not going to get a good sample, it doesn’t matter what kind of tests you do because they will suffer from being inaccurate.”

“The home tests are important because say you do have some symptoms or need to make a decision about if you have to go in or do you want to isolate yourself, they are a quick and easy option to help,” he said. “For example, you have a runny nose and a cough or maybe a little bit of fever and you take that home test and you just discover you’re COVID positive. You can isolate yourself and keep yourself away from others without having to go into the doctor’s office or exposing others by going out in public.

“There is some benefit to at-home tests that can be very helpful for those types of situations,” Dr. Koepsell added. However, antigen tests do have some drawbacks and they can be less accurate in detecting early cases of COVID-19 as there may not yet be a lot of virus in the nose and throat.

Effectiveness of tests varies

“The testing varies based on a large number of variables,” such as “how good of a collection did you get—that can really affect how well the test performs,” Dr. Koepsell said. “In general,” the PCR test—or the genomic test—“of the virus is very, very sensitive and can pick up the COVID infection much earlier.

“And sometimes it stays positive a long time after a patient is no longer considered infectious, so it’s very good at picking” up the virus, he added. “The antigen test is not as sensitive. It can miss some cases of COVID-19 infection, but it is much faster and more widely available. The benefit there is if you have a less sensitive test, but you can test more often.”

False negatives can happen

“This is true for COVID-19 testing, but it's true for all laboratory testing. There are going to be some that are negative when they should be positive and vice versa,” Dr. Koepsell said. “Depending on the type of test that's out there and its characteristics, some tests are 80% or 90% sensitive, and we'll catch at least 80% or 90% of people who are infected.”

“Others are much less sensitive. There's a huge variety out there,” he added. “That's why people can't rely on testing negative and go do high-risk activities or be around somebody who is very susceptible to the disease because it could be wrong. It could be negative when, in fact, they are positive.”

It's a snapshot in time

“The other thing with tests to remember is that they're a snapshot in time,” said Dr. Koepsell. That means that “a negative test today doesn't ensure safety for tomorrow because people can be infected at any time point.”

“You have to really consider factors of exposure. Are you wearing your mask when you're around others in public? What are your symptoms?” he said. “And those all have to be taken into consideration when interpreting these tests.”

That's why “it's not as simple as positive or negative. I'm good or not,” Dr. Koepsell said. “You have to really understand that a negative test could mean a false negative and you could in fact be infectious.”

Antibody tests don't mean protection

“We are learning that antibody testing—because it's easy to do and it just requires a little blood sample—can sometimes be a really good predictor of how immune you are to the virus,” said Dr. Koepsell. “What's cool about antibody testing is that there are two broad categories of antibodies that we can make to the coronavirus.”

“One is called the N protein antibody, or the nucleocapsid antibody. And the other is a spike protein antibody,” he added. “The vaccines work by giving our body a little bit of the spike protein, so when we’re vaccinated, we make antibodies to the spike protein itself.”

“With natural infection, you make antibodies to not only the spike protein part of the virus, but also the nucleocapsid or N antibody,” said Dr. Koepsell. “You have both types of antibodies in natural infection, so these tests can be helpful for sorting out whether or not you’ve been naturally infected, vaccinated or both.”

“That can be helpful for sorting out questions about the past. It doesn’t necessarily give you any information about what to do in the future though,” he noted. While “it’s interesting to find out if that cold I had last year was COVID or not, it doesn’t necessarily prove that you’re immune at this point.”

Discover [three big limitations doctors must understand about SARS-CoV-2 serology tests](#).

Tests determined need for more doses

“We found very early on after the vaccines were introduced that people who are immunocompromised didn’t always make an antibody,” said Dr. Koepsell. “That helped lead to the research and recognition that people who are immunocompromised need” another dose.

That’s why an antibody test “can be helpful in some ways, but it’s not very helpful for any one individual to determine what to do next in their medical care,” he added.

Discover [what to tell immunocompromised patients about COVID-19 vaccines](#).

Tests change with emerging variants

“We certainly saw a lull in testing before the [Delta variant](#) became widely circulated,” said Dr. Koepsell. “With the advent of Delta, there’s been a lot more infections and testing has increased after that.”

“We are constantly making sure that our tests are able to pick up the variants because variants are changes in how the virus is encoded or changes in the virus genetics, RNA,” he explained. “If our tests target an area that changes, the test might call it negative when it’s actually positive.”

“We do a lot of work in the background in our laboratories to make sure that the tests we have pick up the variants that are coming out,” Dr. Koepsell added. “The technology has evolved to the point where—in real time essentially—we are sequencing positive samples all the time and getting results out very quickly within days to determine if new variants are going around or not.”

“There’s a lot of interest into what is the next variant going to look like and what does that mean and how are we going to detect it,” he said.