Question: In terms of the vaccines currently available, there is not a lot of information on who's responsible for prioritizing the distribution, but it sounds like it's up to the states. There isn't enough information for people to know when they can access the vaccines, where its coming from, and if the federal government is distributing them, who is involved in setting up the list for who can get it first, who's next? They're talking about it being widely available in the spring, but there's a lot of confusion about who can get it now; is there going to be universal information or a process? This is causing a lot of confusion, and the variability from state to state and adds to the fear.

Answer : For the prioritization, there is an advisory committee for Immunization Practices that hosted a series of meetings most recently before the recommendations for the tiered system came out, and that's where subject matter expert group reviewed existing data, current policy and developed the prioritization scheme, which was a set of recommendations. Each state has its own rollout or implementation plans, and they vary a lot. In Maryland, the plan was first giving it to tier 1 (healthcare workers and seniors in long term care facilities), but the execution and public response with uncertainty or low confidence in the system is in part due to the speed with which this is all happening , including the handoff from the federal government to the states. There is variability among states, Florida, for instance, has a first come first served basis as opposed to a tiered system.

If you look at what we've done over the past year with the vaccine, one thing to consider, and perhaps something we in the public health, research and clinical world can do better in is not just educating about this vaccine and the process, but more about educating the public on what the normal vaccine development process is, and how much we are deviating from that. We develop and approve vaccines all the time and they go through testing and approval, so how is this different from any of that? One big difference is the timeline having been compressed. This doesn't affect the development process in terms of the safety checks, or the rigor of the science. In some ways it was actually more rigorous as it went into more people than we normally have data on before we get an authorization. After a vaccine is authorized for emergency use or approved, the Advisory Committee on Immunization Practices (ACIP), which is overseen by the CDC, includes outside experts like a CAB, who come together and come up with these recommendations. These are handed down to the states to state health departments, insurance companies, Medicare/Medicaid to take their cue from the ACIP recommendations as to what they will cover or not cover for each population. Afterwards, the state health departments are supposed to take this and tailor it to their specific population.

In addition to health departments, a lot of states have set up their own separate committees specifically for COVID-19, to advise the governor and health system on the deployment of vaccines within their states. Operation Warp Speed has been very much involved in the development process and is supposed to be helping with deployment. But the prioritization doesn't come from OWS but standard process of CDC ACNP to the State Officials. With of the politicization of the process due to the speed at which a lot of this is happening, these normal processes have a lot of variability. We're trying to follow the normal process, but deviations occur, which are frustrating to us as well as healthcare providers. We lack a nationalized system for vaccine development and distribution, that's partly why we get so much variability.

Question: A number of essential workers, including healthcare workers are refusing vaccination, what is driving that mistrust? Is this same level of hesitancy shared by Black and Latinx populations?

Answer: Those are key questions and I think part of why having a CAB to represent the community is so important in understanding and learning what drives people's behavior and their beliefs. There's obviously factors of history. I have not read the same reports of health care workers and frontline workers not choosing to take vaccine. The similar broader issue is people's uptake of the non-pharmacological interventions including mask use, maintenance of social distancing or physical distancing, compliance post- exposure and testing or isolation. What drives the variability in human behavior is the fundamental issue that we're exploring to hear and is what we can learn from this CAB. What information is presented, how is information interpreted, what would make people bring themselves to the clinic? How can we bring our experience to every interaction with the public health and clinical and political realms that influence this process?

We're only starting to collect the data in terms of vaccine hesitancy, so we all have anecdotes as to reasons for people's hesitancy to taking the vaccines. However, activities like this and the more formalized research and socio-behavioral science that has matured over the past 10-20 years in the context of vaccine hesitancy that wok is being done, and it's not so much of a literature that I have followed. It will be important to apply the rigorous methodology that we use for other parts of vaccine development to this part as well. As volcanologists, we don't care about vaccines, we care about vaccination and without that piece of understanding what are socio-cultural communication behavioral barriers to vaccination, then what's the point of just making a vaccine that just sits on a shelf?

Question: Are the current vaccines these two in the USA with EUA approval effective against the new variants that we're reading all about?

Answer: That's a very timely question, just this morning there is a report under review. Pfizer did a study looking specifically at this question; Will the vaccine work against the new variant? Anytime there's a change in the virus or the infection, it raises immediate concern on whether there are tools to find it through diagnostics and whether the preventive vaccine will still work. So Pfizer took leftover blood donated from people in the original study, and did subsequent studies to look to see if the new virus was still able to prevent infection .The vaccine is operating to prevent infection, as its primary goal by preventing the virus from entering cells and infecting them (neutralization). They found that with the vaccine and using blood that had been stored from vaccinated people to give variants to the blood it neutralized at the same level and looked effective. The consensus in the field is that these vaccines do appear to have broad protection in terms of coronaviruses.

Question: What is the landscape of vaccines, the mutations and the side effects?

Answer: About the mutations such as the ones in the UK and South Africa, this is what viruses do, they mutate and that's how they stay around, adapt and stay circulating. The longer a new virus is in a population, the more it's going to have accumulated mutations which makes it able to adapt to our bodies. There have been thousands of mutations on this virus since it came out exactly a year ago, most of which do not have any effect on the behavior of virus or how it causes disease but every so often it does make a difference. The most important mutations that could affect the efficacy of the vaccine and monoclonal antibodies are in a spike protein.

Looking at a spike protein, the spikes are the parts that latch onto your lung cells and mediate entry of the virus into your lungs, and then it can go wild and reproduce and cause disease. There's a part that's very important, the receptor binding domain, or RBD, and that's the part that interacts with the receptor on your lung cell. When it touches your lung cells it causes a change in the shape, so that the spike protein now becomes sphere and it pierces your lung cell and then draws the virus against the lung cell and then they fuse, that it can deliver all of its contents into your cell , take over its machinery to reproduce. When we give a vaccine, any vaccine, they're just different delivery vehicles for the spike protein, so this is what's being used to educate your immune system, so that you develop antibodies that are targeting the spike protein and mostly targeting the receptor binding domain. So, when the virus comes into your body, these antibodies attach to it and prevent the RBD from being able to make a way into your cell. Vaccines can create lots of different types of antibodies, it gives what is called the polyclonal response, many different clones that if there is one mutation on one close you still have all the other antibodies around that are still preventing your lung cells.

So far, Pfizer has come out publicly and Moderna will release some data soon that indicate the vaccines are still effective. There could come a point where you may get too many mutations, so that the virus that you based your vaccine off is so different from the virus that is now circulating, that the vaccines may not work. That is still a possibility, that's what happens with Flu every year, you get enough mutations in the flu virus where the vaccine from the previous year based off of a virus from the previous year looks very different from the virus from the current year.

Question: What is different about the WRAIR COVID Vaccine that's being taken forward into clinical trials? There are so many vaccines out there now, why is another necessary?

Answer: We took the long-term approach that we know that we wouldn't be able to launch as quickly as some of the other groups. We have developed a protein called ferratin, that allows you to put multiple different spikes on it. Therefore, one vaccine can present very different strains or species of virus, to help train your immune system against multiple strains of COVID-19 virus and so your immune system is now trained against all of them at the same time. That's the idea of our SpFN vaccine approach.

Question: How many doses will the vaccine have?

Answer: It's very hard to get a vaccine to give you long-term immunity with just one dose. The weakened live viruses are the most likely for that, because they stick around in your body for a while. The way your immune system works is you need to prime it, it needs some time to get educated and then it needs a reminder at some point. We probably can get good protection with just one, but not the 95%protection and not for many years. So, if you need a much longer response, you need multiple doses. Our vaccine also has 2 doses, but if you want long term so you don't have to boost every year or every few years, 3 doses would be best. In our study, the first time we're going to actually look at the data will be after 2 doses, but we have built into our study a 3rd dose option for people as well, to be able to see if we get a longer response in those individuals.

Question: What will be the time between the first vaccine dose and the second dose?

Answer: The Pfizer is 21 days, Moderna is 28, Johnson & Johnson is looking at one-dose alone, but it does have a two-dose version also. All these vaccines you're going to see coming along are either 3 weeks or 4 weeks between the first and second vaccination. For us, it will be a month later for the second dose, and then 6 months later is the third dose to see if you can get a longer-term impact. It's always helpful to look at other vaccines to see what's typical.

Generally, vaccines are given 2 months apart. Hep B and HPV are given at 0, 1, and 3months intervals. TDP is given at least several months apart. The longer you can extend the period between vaccinations, the better and longer response you get. And you can't go less than three weeks. So will people come back for their second dose.

Question: Are there any in the Pfizer and Moderna that haven't been found in the AstraZeneca and Moderna vaccines?

Answer: The symptoms, side effects are very similar across the vaccine types. As you outlined, the Pfizer and Moderna vaccines are mRNA, but the J&J and AZ vaccines are virus vectored, but those use an adenovirus, it's another type of virus that can cause disease, but they modified it so it can't cause disease, so it's just a vehicle to deliver the genetic code for the spike protein, and then your cells become the factory for making it. Same here, instead of the piece of mRNA, a defective virus delivers the material into your cells. There's something about the spike protein that's generating all the side effects, and it's usually after the second dose where side effects are worse… pain in the arm, muscle aches, fevers, chills, fatigue and lethargy… and we're seeing that across all of the different vaccines. People are looking to see if after the first dose, do you develop antibodies to the virus and to the delivery vehicle, such that the body attacks the vaccine? That's specific to the AZ and J&J vaccines.

Question: How long will the vaccine protection last?

Answer: We don't know right now. That is something we're going to learn about, the durability. Maybe we'll need a booster annually, or every 10 years, or 5 years. It also depends on how often your immune system is primed. If your body doesn't have a lot of exposure to the virus, your immune system forgets faster.

Question: Will there be enough of those that we'll need to change the vaccines from year to year. We don't know enough yet.

Answer: Flu is a common analogy. A big difference with this virus, which is an RNA virus is RNA virus tend to mutate a lot like the flu, which has 8 strands of genetic material as opposed to 1 strand. We don't know If this virus will mix into animals and come back to humans, but we know this virus doesn't mutate as quickly as flu. Being an entirely new virus, we still have a lot to learn. We don't think it mutates as much as flu, but does it mutate like the other coronaviruses that we do know of? Maybe?