Dr. Henry Masur
Behind the Mask
December 14, 2021

Barr: Good afternoon. Today is December 14, 2021. My name is Gabrielle Barr, and I am the archivist with the Office of NIH History and Stetten Museum, and today I have the pleasure of speaking with Dr. Henry Masur. Dr. Masur is the Chief of the Critical Care Medicine Department at NIH's Clinical Center, and today he is going to be speaking about his COVID-19 experiences and work. Thank you very much for being with me.

Masur: Good Gabrielle, I am happy to be here.

Barr: When did you first start preparing for COVID-19, and what did that entail in terms of training of your staff, stockpiling of materials, and just attending to physical changes to the building to accommodate for the infectious patients?

Masur: I think when the Clinical Center was first built, it was designed with the idea that COVID-19 is the kind of situation that we would be prepared for. Certainly, during my time here, which goes back now almost 40 years, dealing with the HIV epidemic was a good preparation for this because HIV, of course, was a transmissible agent we were not clear how was transmitted so we had to prepare our staff and our facilities to protect everyone while they were caring for patients with a deadly disease. We slowly learned how to organize our facilities, how to organize our safety precautions, how to train our staff, and over the years, we have been well aware that there may be other transmissible agents, and they might be transmissible not by sex or blood but by aerosols or droplets and contact. During the period between HIV and COVID-19 we have been studying influenza; we were interested in the first SARS, although we did not have a patient here; we had experience with Ebola, so we have been preparing our facility and preparing our staff for transmissible agents for a long time. In addition, we are a facility that is ready to care for any Federal lab worker who gets exposed to a high containment pathogen, so that if they have something that they have acquired either by aerosol or contact, we have a special care unit here that was developed so that these patients could be cared for as safely as anywhere in the country. We have been prepared for COVID for a long period of time.

Of course, we did not know when it was going to come, and we did not know exactly the form it would come. When the first cases of COVID were reported in early 2020, we recognized that there is a possibility that the patients could wind up here, just as when we heard about Ebola, we realized that even though that was a disease in West Africa, patients could come here because there might be expatriates who would be transported back to the United States, there might be health care workers, there might be Federal officials who in the course of their duties would get infected. In fact, we did have some Ebola patients, and we had a unit that was specially prepared for that, and I think, we did a great job of both caring for the patients, learning about the disease, and keeping our staff safe. So again, we have been ready.

When COVID was first reported, we thought about how our special care unit, which is run by NIAID (National Institute of Allergy and Infectious Diseases) with support from Critical Care, might be utilized. And as the cases began to escalate, we began to wonder if the Clinical Center would need more bed space than that special care unit could provide. Our preparation was really in several folds. First of all, we had to keep up with what the clinical manifestations and current, evolving management strategies

were for this disease. We understood what was known about the pathogenesis of the disease how it was transmitted, and what little was known about how to care for it. As more information came out about how it was a droplet-spread organism and aerosol, we had to think [about] if patients had to be cared for outside of the special care unit, which was specifically designed for this, if we had more than four patients [the size of the special care unit] or they needed more specialized ICU care that the unit could provide, how we were going to care for them.

As more and more cases occurred in the United States, we realized that we would get patients from two sources. One source was patients who might be on various NIH protocols and happen to get COVID, but we also realized that we were going to undoubtedly be part of the research effort to try to understand COVID, so we might bring patients with COVID specifically here for research protocols. The other thing, which we subsequently learned, was that the community became overwhelmed and, as part of the community effort to care for patients who were overwhelming regional hospitals, could we take patients who just needed routine care without being on a research protocol. There were really three sources of patients that we were going to get, and we needed to develop an operational plan.

First of all, we have a 12-bed ICU with a six-bed intermediate care unit. We decided that because so little was known about transmission of this [COVID-19], we should probably set up a separate COVID unit. Patients were physically isolated from other critically ill patients. We also realized that we had to re-engineer our workflow process because if this was a highly transmissible agent, we had to make sure that when staff entered that unit, they were appropriately prepared, which meant being in the appropriate personal protective equipment suits, masks, goggles, etc. We had to make sure that they did not contaminate themselves or others with the equipment they took into the rooms, and took out. We had to think about how the unit was set up, to be clear as to what area was hot or potentially infected, what was warm or less risky, and what was cold or no risk at all. We had to make sure that all the staff knew where to go, what personal protective suits to put on, and how to discard them so they did not contaminate themselves or others. We had to do some construction in the unit: we had to put up barriers; we had to make sure the air flow was appropriate. There was a lot of engineering and building to go into the change in the workflow process. We also had to make sure that we had enough equipment in terms of personal protection, masks, and goggles. We had to make sure that we had everything in that unit so the unit could be self-contained. That meant that we had to reproduce in the COVID unit all the emergency drugs we had in the ICU so that we did not have to take potentially contaminated vials or boxes back and forth. We had to make sure the equipment like bronchoscopes and ventilators, once they went into the COVID unit, did not come out unless they were decontaminated carefully, and that again, required buying extra equipment and having duplicates on the COVID side and in the non-COVID side.

We also had to think about how to staff it because at first we were very concerned that staff might transmit COVID from one patient to another either on their clothing or they might become infected and then transmit COVID to patients in the non-COVID unit. In addition to the engineering of the facility, we also decided that we would have two teams so the COVID team would not be taking care of someone else. That in retrospect was probably more than we needed to do, but at the same time when we were not certain, we decided we would be overly cautious, but this also required us to train our staff and make sure our staff understood what the risks were and how to mitigate them. At that point, we were not really sure what the risks were. Dealing with unknown risk was reminiscent of the early AIDS epidemic, and we had learned the lesson there that requiring the staff to work with unknown risk was not necessarily the best strategy as opposed to asking for volunteers. People come to work at NIH because they understand they are going to be at risk; they understand that they are going to be taking

care of different kinds of patients, but we still did not want to force people to do things they were uncomfortable with. We spent a lot of time educating the staff, making sure they understood what the risks were, and then forming teams of people who were willing to take those risks. I think [with] our experience with Ebola and as with our experience with HIV, the majority of staff understood the risk and were enthusiastic and willing volunteers. They felt that they went into the healthcare professions because they wanted to take care of patients, and they understood that there were some risks that they have to take. And actually, within a very few weeks almost everyone volunteered to work in this unit, i.e., many of the initially reluctant become less reluctant, but it took still a lot of education and training to make them comfortable with this unknown challenge. It took a lot of work with Hospital Epidemiology, which was key to making sure that all of our procedures were safe, that they reviewed them, and they met the standards of other organizations with which we were interacting. The Hospital Epidemiology did a great job building and setting up systems so the staff could be tested to make sure that they had not been infected either in the unit or outside of the unit so they could be assured that they were not transmitting the disease to their families, and so that we could be sure that we were not putting staff at unnecessary risk by overlooking some process. If you are asking: "How did we prepare?" we really had started preparing when the Clinical Center was first opened, and we continued preparing as we learned about HIV and Ebola and HCV and West Nile, and we knew well the respiratory problem was undoubtedly going to occur. I think that we were ready, although we certainly had to accelerate our preparation when COVID arrived, and we had to make structural and engineering changes to our facility to deal with an agent that we soon learned was a highly transmissible aerosol agent.

Barr: Did your staff test because they were exposed to more COVID patients more frequently than say the average NIH employee?

Masur: Yes, I think accessibility to convenient testing to expanding our knowledge and allaying employee fears because we had to learn whether or not the precautions that were taken were effective. The only way we could really tell that is to see if we asked them to follow our procedures, we had to make sure that in fact, they were not getting infected. Part of the testing was to assure them and to assure ourselves that we were doing the right thing to protect our employees. Of course, if we had found out that individuals going into rooms to perform an intubation or a bronchoscopy were getting infected, then we would have had to re-look at our processes. As it turned out, we have almost zero transmission from patient to employee, or from employee to employee in a health care setting. We did have a few outbreaks related to meetings or to overcrowding of break rooms where staff were eating, i.e., without their masks.

Barr: That is great.

Masur: Yes, we did not have any patient-to-staff transmission that we are aware of. As COVID became more common in the community, we did have staff who developed COVID, not because of their contact here, because of the contact elsewhere. Then there was some transmission in the building from a community-acquired COVID infectious staff member to another staff member, and we learned what some of the high-risk exposures would be, for instance, eating in a small break room with your mask off. Like the rest of society, we learned some of the processes of what to do and what not to do. Because we were following people so carefully, they had confidence that what they were doing was safe, and leadership had confidence that we had a safe process for employees, patients, and the small number of visitors allowed in the building. I think the Clinical Center was very successful in limiting spread of this transmissible virus through wonderful collaborations among the Office of the Director, Hospital Epidemiology, Engineering, Patient Escort, Nursing, and Dietary. Everybody took this very seriously and

looked at what their role was and how they could minimize the risk. I think the Clinical Center really did a wonderful job at both expanding our knowledge about how this virus was spread and minimizing the risk from patient to employee.

Barr: One of the innovations that I have heard was that in one of the ICU's iPads were put on IV polls to minimize the risk for nurses constantly going into the room and being with COVID patients. How are you a part of that?

Masur: One of the innovations health care workers around the country found was that you can probably do more remotely with patients than we would have suspected two years ago. This, of course, is seen in telemedicine where more and more visits are made with your health care provider by video conference. We found that there were times when we did not have to go into the room. We could talk to the patient via some kind of electronic device. iPads were good since the patient could talk to us, and we could talk to them, and we could see some of the things that were going on. This did not replace the need to go into the room intermittently, but iPads minimized face to face interactions. I think that was one of the innovations that we learned, and we will continue to use for high containment pathogens because, again sometimes, you need to go in and deal with the IV, you need to have hands-on care of the patient, but sometimes when you are looking to see if the patient has pain, or if you are looking at other things on the monitor, you can see with the iPad all the things that you need to know.

Barr: What was it like for you when the first few COVID-19 patients arrived in the Clinical Center? Can you relay what that experience was like for you and your staff both in terms of what you are thinking and feeling and also in terms of what actions were done?

Masur: There are really three feelings that you have when you have a patient like that. First of all, the reason most of us came to work at the Clinical Center is that we want to be on the forefront of new and exciting diseases. That is why we came here, and it is exciting to get an Ebola patient, or a COVID patient, or an HIV patient and to be able to contribute to understanding the disease and developing new management strategies. There is uncertainty because you would like to take good care of the patient, and obviously, early in the epidemic very little was known so you are worried about how to provide the best care. You are worried about transmission; everybody has a little bit of concern about their own safety and the safety of their families should they become infected and transmit the virus at home. Certainly, in a supervisory position, you want to make sure that you are not putting your employees at unnecessary risk, so there is that concern, but I think, overall, it is really the excitement of having a new disease and thinking we are here, at the Clinical Center. We have wonderful resources, and we can make a contribution to understanding how to better manage these patients, so these patients have a better outcome. I think there was some fear for personal safety; there was some trepidation about understanding what the best intervention for the patient really is. There was, however, real excitement. This is what we are here for.

Barr: How has the care of patients with COVID-19 progressed over the course of almost two years at the Clinical Center?

Masur: I think in the Clinical Center, like the nation as a whole, and the world as a whole, we have gone with spectacular speed in terms of understanding almost nothing about this virus, to understanding a lot about how to manage it. We certainly do not know everything we need to know, but I think, from a historical perspective, the amount of knowledge we have gotten about the natural history of the disease, what part the virus plays, what part the immunity plays, what drugs are useful or not, has really

been amazing. Individuals who got the disease early on did not have the benefit of the demonstration that steroids are effective therapy at certain stages of illness and that specific antiviral agents could be developed. I think, in terms of a more historic or global context, the fact that we've learned so much in two years, and that from not knowing anything about how to treat this disease two years ago, to understanding now that, number one, we know how to prevent the disease in most cases with a vaccine, and that if you come in we have interventions that can dramatically improve your outcome, I think that has been both tragic for the patients that we were not able to cure and exciting in terms of the patients now that we can take care of, and I think that there are a lot of insights made in the Clinical Center that made major contributions to national and global progress for controlling the spread and impacts of COVID-19.

Barr: In the beginning, it seemed like a lot of patients were put on ventilators but now for a lot of them, you try to use other kinds of methods because there are issues sometimes with the ventilators, with patients not recovering as fast or getting secondary infections, or you have just discovered other types of interventions that work as well. Can you talk a little bit about that transition?

Masur: Providing respiratory support is obviously something we hope patients will not need, and yet, if somebody reaches the point where either they cannot ventilate, meaning that they cannot move enough air to get rid of their carbon dioxide, or they cannot oxygenate, meaning they cannot get enough blood into the bloodstream, they need to be put on some kind of supportive ventilation. This is similar to the situation with other viral and bacterial pneumonias. With knowledge about pharmacologic interventions, and noninvasive ventilatory support, we are better at intervening earlier, so they do not get that sick, but once they get that sick, they need to be put on a ventilator. We know that there are interventions that can prevent that; we know that there are physical modalities like what we call proning, where patients that had been on their back are on their stomachs, and that can sometimes prevent the need for mechanical ventilation until something else works. Unfortunately, we still have a lot of patients on ventilators, and even today in December of 2021, there are virtually no ICU beds available for new patients in Maryland, Pennsylvania, or Delaware because existing beds are full of COVID-19 patients. Patients again were waiting in emergency rooms and ventilators are a cause for many of these ICU patients. Unfortunately, we still have a lot of unvaccinated patients who are at high risk of severe disease if they become infected with SARSCoV-2

Barr: Can you talk about some of the therapeutics, techniques, and procedures that have been tried and used with COVID-19 patients at the Clinical Center?

Masur: We can look at both what has been done nationally and what has been done at the Clinical Center. The extramural programs at NIH developed therapeutic studies with impressive speed, completed enrollment promptly, and identified which modalities of therapy were useful. Intramurally, on the NIH campus, phase I and phase II trials were also initiated quickly. There are certain things that we do better here at this intensive research hospital, i.e., phase I and phase II studies, and there are certain things that other places do better because they can recruit larger number of patients much faster, i.e., phase III studies. In the beginning, one of our emphases was trying to understand the natural history of the disease. e.g., exactly what the virus did to the lung or other organs, or what aspects of immunity were responsible for extending damage of for allowing recovery. At the NIH Clinical Center, we can do very intensive studies on serial immunologic changes, serial imaging changes, assessment of tissue via biopsy or autopsy. We can do serial bronchoalveolar lavages, serial MRIs, and we can get biopsy samples: other institutions can also do these but usually they don't have the time during a pandemic, or they don't have the funds to support such research activities. We focus on how to

understand the disease, and then we focus on doing small studies trying to understand the basis of, if you use certain immune modulators, if you use certain antivirals, could we see any laboratory effects? If we did see promising changes, then the extramural studies could look in a larger population as to whether or not this had clinical benefit in terms of preventing complications and preventing death. I think it was really a good partnership. We were involved in some of the early studies, for instance, of Remdesivir. We were involved in some of the studies on immunomodulators l. But I think, again, what we really focused on was understanding the virology and immunology of the disease, because with that understanding, you can then plausibly design specific studies that are more likely to be effective than just hoping that you can find something by random chance.

Barr: At what point is it deemed best to stop administering some of the drugs that were tried, that were seen as either not beneficial, perhaps more harmful than helpful, and how do you make that kind of determination for a particular patient, because you care for particular patients, you do not just do research?

Masur: Well, we hope that when we are doing research, we always have the patient's interest and welfare as a priority. I think that one of the cornerstones of ethical research is that you always want to put the clinical welfare of the patient first and the research second, and that is something which our hospital has been traditionally good at, because that is, after all, research is why we exist. Moreover, at the NIH Clinical Center Dr. Christine Grady has developed one of the strongest bioethics programs in the world.

When you use a drug, you want to make sure that there is a good reason to use it. The reason might be a mechanism that you know from a laboratory test, or you might not know the drugs mechanism of action but the drug inhibits the replication of the virus. There might be an animal study that shows that the drug improves outcome or reduces viral load. In order to have the most ethical research, there has to be a plausible reason why you think the drug might be effective, and you have to test it in a systematic way so that you have thought carefully about the toxicity of the drug, you have thought about the dosing of the drug, that you can collect data so you can draw some conclusion. Every time you do a study, you need to think with a multi-disciplinary team: Is it really in the patient's best interest to try this drug? We try to be very careful to at least have thought about all the information we get about the preclinical toxicity of the drug and the data from other trials (if there are any) to think about what are the other options, because if there is another good option, we have to be careful to make sure that it is estimated to [work. For example, if we] think that if steroids work and we want to use drug X compared to steroids, is it really fair to say one patient has steroids, one patient could get something else, or do we want to start steroids plus drug X, versus steroids alone? Again, we put a lot of thought into that so that we protect patient safety and get a clear answer about whether the new drug is safe and effective.

We also want to be sure the patient understands the research they are being invited to participate in. Every participant in a research study is a volunteer. These subjects deserve to know everything we know about safety or risk and about efficacy. It is really amazing that there are so many people who are willing to volunteer, who say, “I have a terrible disease, but the only way we are going to make progress is if we try some new approaches.” There are many people who are willing to take a reasonable risk without the certainty or perhaps the likelihood of personal benefit, but I think it is only fair to explain to them and their family why we think the drug or intervention should be studied, what the risks are and then to make sure that we minimize that risk.

Barr: How have you dealt with providing patients combinations of treatments?

Masur: Combination therapy is part of treating many diseases, and certainly a complex disease like this. If we had a single agent that would cure patients at a particular stage of the disease, we would use that one drug, but in many situations, there are drugs that have different mechanisms of action. In the case of COVID-19, antivirals, antibodies, and immunomodulars have different but in some circumstances complementary roles. Again, it depends on the stage and severity of COVID-19, the patient's underlying diseases, whether we use a single drug or combination, but there is no one right answer. If you have a single drug that has optimal effect for COVID-19, that is great, but often you need one or more drugs to handle the virus, one or more drugs to manage immune responses, and in this case you may need another drug to manage clotting complications.

Barr: Well, that goes into my next question. How have you handled patients who have had subsequent issues through COVID-19 like thrombosis or renal failure, and what have been some of the other conditions that your division has dealt with in the COVID patients that you have seen?

Masur: COVID patients can get very sick, and they can have dysfunction of almost any organ. COVID-19 can be a multisystem, multi-organ disease for many patients. A major question is how much of that is directly related to the virus, how much is due to immune reaction, and how much of it is simply due to the fact that they are very sick? The hallmark of this disease is infection and dysfunction of the upper and lower respiratory tracts. However, we have seen people with cardiac dysfunction, cerebral dysfunction, liver dysfunction, renal dysfunction, and embolic events. Why do these things happen when the virus appears to primarily be a respiratory virus like influenza? How much is really COVID-specific and is this really different from influenza, RSV, or other coronaviruses? How much is the fact that some of these patients, especially early in the pandemic, were not oxygenating well, and had low blood pressure to that perfusing their organs? It has been complicated to determine, which [issues] are specifically COVID and which are specific to the fact that they have multi-system effects on their blood pressure and oxygenation. We are also seeing patients who make an unexpectedly slow recovery because they have much worse long-term lung function than we would have expected, or they wind up having neurologic dysfunction, so they do not regain their cognitive function rapidly, they do not regain their energy, they do not regain their muscle function as expected, and these are all long-term effects that we're trying to understand. There is considerable information about the effect of SARS-CoV-2 on endothelial cells, on the inflammatory cascade, and on coagulation that may help to explain why such short term and long-term complications occur, and why COVID-19 is different from other viral respiratory infections.

Barr: Did you have any role in the convalescent plasma trials that took place at the Clinical Center and also in academic centers around the world?

Masur: We certainly took part in convalescent plasma studies although our role was really looking at very small numbers of patients to see if we could detect changes in their viral load, or changes in their immunity. We were certainly very interested in plasma products. Many of the scientists here are involved in national studies in several ways. Many of the people at NIAID work with their extramural colleagues to design studies and to interpret the data. There are many people here on campus who are involved in that.

A major is understanding how to use convalescent plasma: when in the course of disease is it best to use convalescent plasma, and what are the optimal characteristics of the plasma product. Three months into

the epidemic, Dr. [Anthony] Fauci realized that it would be beneficial to have a group of experts who could look at the data and decide whether convalescent plasma or other options were effective. He created a NIH guideline that could provide practitioners with expert opinion on what to do. He asked his deputy Cliff Lane to organize that, which he did with me and with Roy Gulick, who is the Chief of Infections at Weill Cornell [Hospital] in New York, and Alice Pau at PharmD who serves as the Executive Secretary of the panel. We put together a panel of 57 experts who represented 11 different professional organizations and several government agencies so that we could look at the data as it came out and provide expert opinion, and certainly, convalescent plasma was one of those drugs. For each promising treatment modality that we were aware of we would look to see what was published; we would look to see what was presented in meetings and we would get information from investigators and other stakeholders inside and outside of government, and as soon as there was convincing data that you either should or should not use that intervention, based on the panel's assessment of available published and unpublished data, we would put out an update on our guideline, which was on the web that would be updated every few weeks. In fact, in the first year that we had this group together, this group would have multiple meetings each week, which was a big time commitment for both government scientists and practitioners around the country who were part of this. [Practitioners were] being overwhelmed clinically and had to take time out to put this guideline together.

NIH supported this guideline with an IT platform and administrative support, and the first year we amended this guideline 37 times. We also had 25 million page views, so a lot of people were looking at this. This is also an example of what NIH does in a crisis like this when it is hard for clinicians to keep up with new drugs that are being assessed or promoted such convalescent plasma, or hydroxychloroquine, or steroids. We provided a guideline. which was updated regularly, which was freely available, so that people could see clear and objective recommendations. Busy clinicians during a pandemic often do not have time to look at every published article or even the major articles in major journals. And there are thousands of articles now every month, more than any one person could review. Those accessing the guideline could get the opinion not just of the infectious [disease] people, but intensivists, pulmonologists, hematologists, immunologists, pharmacologists, statisticians, and pediatricians. The hematologists understood clotting, rheumatologists were experts on the effect of biologics, PharmDs understood dosing and drug interactions; thus, the guideline provided a comprehensive, current, accessible, easy to read guide as to what to do. Especially in hospitals that were overwhelmed, where they did not have intensivists, they did not have infectious disease physicians who had time to see every patient, this became an invaluable resource for people who were trying to fill in for experienced subspecialists in either smaller hospitals, or larger hospitals that were just overwhelmed.

Barr: What were some of the other areas that these guidelines covered?

Masur: These guidelines cover what we think are the key issues that providers want to know. They want to understand the natural history of the disease: What is the incubation period? What are the first signs? What are the complications? They want to know how to diagnose it. They want to know how to treat COVID-19 in the early stages, how to treat it when [the patients] start needing oxygen, and how to treat it when they get in the ICU. We are dealing with both the drugs that you need in various stages, and the support issues like oxygen, mechanical ventilation, [and] proning. We are really trying to provide all the comprehensive information that a treating provider would want to know. We want this information to be current, concise, objective, easy to access, and easy to read.

Barr: Back to the Clinical Center, I had two other questions, one of them being: Did you have to triage any of your COVID patients? I know that the Clinical Center is different than a typical hospital, and if so, how did you go about doing that?

Masur: We were fortunate that we were not as overwhelmed as other hospitals in the community were. We were able to accommodate all the patients who were on protocols here and who developed COVID. We were able to bring in patients with COVID for specific COVID protocols, and we were able to help the State of Maryland deal with surge situations in various parts of the state. We took some non-research patients that had no other ICU place to go. We were able to accommodate all the patients that we needed to and to help the community as well. It is a terrible problem if you are in an ICU and the emergency room calls and you have no more beds, but we fortunately, were not in that situation, unlike many, many hospitals that heroically took care of so many patients.

Barr: Did the Clinical Center have to perform any lung transplants, or any other organ transplants due to COVID-19?

Masur: We do not have a solid organ [transplant] program here.

Barr: What are some areas of treating COVID-19 patients that you think need to be further advanced?

Masur: We need to know so much more about COVID-19 than we do now: virology, immunology, endothelial cell biology, coagulation. We need better diagnostics and therapeutics. We need better implementation strategies so that the community has access to what they need. We need to be able to intervene with an antiviral when the disease first occurs; we need to know how to modulate the immune system so there is not as much damage to the lungs or other organs; we need to know how to prevent the long-term sequelae of the so-called long-term, long haulers COVID, because we do not understand that, and we do not know how to intervene. You could say that from prevention, to diagnostics, to early therapeutics, and late follow-up, we need better understanding of the disease processes and better agents for all those issues. Although again, I think, we have come a long way in two years, we have a long way to go.

Barr: How long is a typical stay for an average COVID patient at the Clinical Center? What is a typical stay, like length of time, that they need to be cared for with intensive care?

Masur: Well, it really depends on what risk factors they have and at what stage of the disease they come in to get the care. We have some patients who are seen as outpatients or call from home for telephone advice or video/telemedicine consults. These patients may not need to be seen at all or take any drugs other than drugs to relieve minor symptoms such as acetaminophen. Other patients come here either to take part in research or for just evaluating how they are doing with the course of the disease. Some such patients become very sick and are on ventilators for weeks. The NIH Clinical Center is like hospitals in the community: there are the walking well, and there are patients who are very, very sick—some of whom survive without sequelae, some of whom had major permanent sequelae, and some of who sadly die from their COVID-19.

Barr: How did you bolster the morale of your staff who worked very long hours and were under a lot of stress?

Masur: I wish I had a good answer for how to do that effectively. You want to make sure that people

do not work to the point of exhaustion, but when you have patients, health care providers are trained to work extra shifts to meet the need of their patients and their community. You want to try to make sure that people keep their focus on the fact that they are providing a tremendous benefit. You want to make sure they are getting rest; they are taking care of their personal health. Unfortunately, sometimes there is no alternative than working to the point of exhaustion: one can't turn away patients, and there are no health care providers available in the community to hire. The staff was not as stressed as many other hospitals but…. they were stressed. Giving them positive feedback, having leadership working with them side by side, providing counseling and spiritual support is important too. The staff need to feel, to make sure that their organization supports them even if all the equipment and personal protection equipment that they need simply are not available. In order to take first-rate care of the patients, staff need to know the organization will support them. They need to make sure that they are confident that if they get COVID, or if they have any stress-related issues, their organization will support them. We try to reassure staff of that, but there is not any magic answer. When the system is overwhelmed, when there are so many patients who need care, it is exhausting, and it can be discouraging. What we can do is, certainly, tell them how much we appreciate them, and try to make sure that we do not push them beyond their limits, but it is hard to decide when that point is. In addition, staff are dealing with all the pandemic stresses at home: family members who are sick, children who are not in school--staff have their own challenges outside the hospital just like everyone else.

Barr: How did you reassure patients who may not be able to be with their family and friends due to COVID-19? How did your department try to facilitate that they still felt a human presence and that they were being cared for and try to connect them in other ways?

Masur: First of all, having iPads and having Zoom calls is at least one way that patients can connect with their family, and some patients were able to do that because they were not that ill. Such contact is obviously not as good as real personal contract, but it provides some emotional support. For many patients, it was very difficult, sad, or tragic. I think the staff has been incredibly resourceful in talking to patients, talking to their families, spending extra time. It is amazing that it is not just the medical staff, it was also the other staff, whether social work, or administrative staff, who helped the patients in so many ways. It is difficult, and there is not any good solution to the fact that their families are not here, other than the fact that the staff here, and I think in the hospitals throughout the country, are amazingly compassionate at trying to help patients get some personal attention even though their families cannot be with them and the staff are at times physically and emotionally drained.

Barr: Now we are going to transition to some of your personal thoughts and experiences in these last few moments of the interview. What are your thoughts about how the pandemic has impacted formal and informal routes of scientific publishing? What have been some advantages and what are some of your concerns, as I know that you have been editor of some journals, and you also keep up with the scientific literature?

Masur: Everyone recognizes that in a pandemic there is a real need to get information quickly out to the public. Journals have been very good at moving information quickly and posting articles online early, even when the article was not completely edited, so that people can take advantage of the information. The FDA and CDC also accelerated their review process and their communication efforts so that current information got out quickly. I think that in many ways, information has been spreading more quickly, although the problem then becomes that because there are so many different ways in this current era to spread information, there are unpublished and unreviewed manuscripts that are made available, and it is very uncertain to know what the quality of the information is. There are statements made on the

internet from sources that appear credible or are credible, and it is hard to know which of those are reliable and which are not. When somebody announces they have a new drug, or a drug company issues a press release, it is very hard to know when that is credible and when it is not. We used to rely, exclusively, on what we call peer review—where an article is sent to a journal, and the journal sends it out to reviewers—but while that is important, there is some information that is so important, that we cannot wait for a journal to peer review it. For instance, our guideline committee will sometimes talk to investigators, talk to companies, and make its own conclusion based on the data which the panel can pro-actively acquire. The panel works actively with CDC and FDA, but again, I think that journals are doing a better job of moving things quickly, although because there is such a rush to get information out there, sometimes even very reputable journals publish material that I think, in retrospect, they are sorry they published because it was not solid, it was not as carefully reviewed as they would have liked. At least, we found a way to get the information out there. The guidelines have been a very valuable way to try to mediate what good information is from the not so good information. Professional societies have also done a spectacular job getting information out to their members and making that information available to nonmembers.

Barr: Do you think NIH will produce other types of guidelines in the future? It is something that it does not do regularly.

Masur: Right now, the only guidelines that NIH produces, that I am aware of, are the COVID guidelines and a series of seven HIV guidelines that have been produced since the 1990s. It is a complicated issue as to what the role of NIH should be, in terms of disseminating information like that because we certainly have a lot of expertise, NIH is a research organization. Communication is an important part of our mandate, but clinical practice guidelines are in a gray zone in terms of organizational mission. The question is: Is this the role of NIH, as a research organization, to be providing, or is this something that professional societies should be doing? Traditionally, NIH has decided that professional societies have the primary role here, except in special emergencies. HIV and COVID are great examples where NIH stepped in, but to some extent, this diverts us from our primary role, which is research. On the other hand, we do have an obligation to disseminate that information and the question is: Should that be guidelines, or should that be another kind of publication [so] that the professional societies can put the package together? There are obviously hundreds of diseases that would benefit from current, objective, multidisciplinary guidelines. Is NIH the appropriate agency to develop such guidelines and to use their resources for that important function?

Barr: What have been some personal challenges and opportunities for you that COVID-19 has presented?

Masur: For any health healthcare practitioner, whenever there is a new disease like this, one of the challenges is how can you create new knowledge and new therapeutic products and strategies to enhance and improve care, and, importantly, how do you decide how much attention to focus on this new emergency versus other diseases which are high priorities for the people who have, for example, cancer, or rheumatologic diseases, or metabolic diseases. You want to divert enough resources so that you get important answers to questions about the current public health emergency, but you cannot ignore other diseases, so one of the questions is: How do you strike that balance? I do not think that there is any clear rule, but, for instance, almost everybody in our critical care department converted some of their research effort to something that was COVID-related. They used the skills and the knowledge they had from some other diseases. Since we are supported by the Federal government, we have to make sure that the taxpayers are getting what they paid for. They pay NIH to provide research.

We want to make sure that we are getting the right balance between this emergency and other diseases which are serious and life-threatening, so we all worry about that constantly.

Barr: I know that some of the NIH has resumed some research on some other diseases, other than COVID in the past couple of months. Were you involved in that transition?

Masur: Well, all the groups at NIH have maintained their programs in high priority diseases to some extent. For some patients you cannot defer their stem cell transplant or their cancer chemotherapy, you cannot suspect their HIV treatment, you must still consider patients currently receiving therapy, and patients who urgently need their life-threatening disease treated. We have a program that deals with HIV and opioid use in the District of Columbia. Those are still terrible problems. If you look at the number of people who are dying of opioid overdoses, it is a huge problem. We cannot stop that program, and we have continued those programs even though they are modified because of the challenges and dangers that COVID-19 presents There is a balance between where the pandemic risks are and making sure you are fair to all populations.

Barr: What has been most rewarding for you of working at NIH during the pandemic?

Masur: The most rewarding part of NIH is the people that we work with here. They are so dedicated to whatever their roles are, whether they are doing science in the laboratory, or they are taking care of patients, or whether they are providing the infrastructure in terms of housekeeping and engineering and procurement and personnel. In the NIH community, and actually in healthcare organizations around the country, healthcare professions have really stepped up and done a wonderful job of responding, even though, as you said, it can be exhausting, it can be frustrating, it can be sad. That has been the energizing part. Also, the fact that NIH is able to be flexible and to pivot their focus and resources when there was a problem of this magnitude. It has really been invigorating to see how much we can accomplish when we are faced with an emergency, and it is not just NIH but also universities and community hospitals. It has really been a privilege, which may be an overused word, but I think I am proud of being part of the healthcare establishment That responded so universally to this pandemic.

Barr: Is there anything else that you would like to share about your experience at NIH during the pandemic, or your personal experiences, or any thoughts about the pandemic in general?

Masur: There are times when people wonder why does the Federal government support the Center for Disease Control or the FDA {Federal Drug Administration] or NIH, and particularly NIH, which is doing research that can seem abstract. But if you think at how NIH intramural and extramural have made contributions, whether it is HIV, or Ebola, or COVID, it is because we had the research infrastructure here. We were able to study the basic processes, and we knew a lot about retroviruses when HIV came along; we knew a lot about filo viruses when Ebola came along, and we knew a lot about respiratory viruses. Some of our knowledge was based on basic research, some on drug development, some on experience with similar diseases. When COVID-19 appeared, NIH was able to very quickly get a handle on what was going on, and I think to make significant contributions. The message is, the investment that you make in a place like NIH may not be obvious every year unless you know a lot about individual diseases, but when suddenly there is a major emergency, we have the infrastructure, we have the knowledge, we have the expertise to allow the country to quickly make discoveries that change people's lives. Federal support of places like NIH are vital so that we can deal with the chronic diseases and the unexpected emergencies.

Barr: Well, thank you very much for all of your work, and I wish you and your staff continued success and continued health, and it will be so interesting to see where the treatment of COVID patents goes in the future.

Masur: Well, I am confident that we are going to continue to make rapid progress, and then hopefully, if you come back and interview me in two years, it will be in a far different position in terms of prevention, in terms of having a much more effective therapy. Thanks very much for your interest in this.

Barr: Absolutely.

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