Thank you for joining the non-stick nuisance medical monitoring for PFAS webinar today, my name is Andrea Amico. I'm a PFAS community leader from Portsmouth, New Hampshire and founder of the advocacy group testing for peace. I'm honored to introduce today's session. We have a few logistics to go over before we start. Here is our amazing lineup of presenters today for our hour long presentation. And here's information regarding the funding for the mid america pediatric environmental health specialty unit program and the disclosure. It is our goal that by the end of this webinar, you will have knowledge on what PFAS are, where PFAS are found, why we are concerned, potential health effects associated with PFAS and how you can monitor your patients health. Now we will hear from Dr. Linda Birnbaum who will provide an overview on high. It's really my pleasure to be here today and to be able to introduce all of you to the topics of PR and Polly floral alkyl substances or PFS. I'm Linda Birnbaum and I'm the former director, currently a scientist emeritus at the National Institutes of Environmental Health Sciences, part of NIH and the National Toxicology Program. I'm also a scholar in residence at Duke University. I served for 40 years in the federal government. And it was wonderful to be in a situation where I was responsible for no one but the American people. So what are these PR and Polly floral alkyl substances, and I apologize for the horrible name. But it encompasses a huge number of substances. Epa now has on their website, over 12,000 of these chemicals have been reported either intentionally or unintentionally, the products of environmental degradation, e.g. so again, they were the products. There are impurities in the products and they are the degradations. If any of you have had Teflon pans or Scotchgard, scotch guard and say your carpets or some of your clothing or your tablecloths that all contain PFAS. The film forming phones that are used to fight fires, the eight triple Fs. There are many formulations, we have no idea what they are. Many of these compounds such as the ones that you can see on the right of your screen. The PFOS and PFOA. Pfos, by the way, was used in Scotchgard and the PFOA in Teflon. What you can see if you look at these, all those little lines are representing carbon-fluorine bonds. This bond barely occurs in nature and it is extremely hard to break. So why do we use these? Well, they're very useful chemicals and industry and in our homes, they provide resistance to grease and water and oil. They function as surfactants and stain repellents. These chemicals, as I said, partly or enlarge part because of that strength of that carbon fluorine bond are persistent in the environment. No one has been able to estimate a half-life for them. We believe it's hundreds of years or maybe even more. They also are very mobile in the environment. So they're not just where they're produced or where they're used. I can tell you that some of the indigenous peoples of the foreign nor North are heavily contaminated by these compounds. And many of them, specifically things like the PFOS and PFOA accumulate in our own bodies. Now the short-chain are alternatives. Those are the two at the bottoms. The PFM OA and the Gen X have fewer carbons, but they've got lots of fluorines of the short-chain alternatives. Very few have a lot of data on them, only a couple. But that they have suggests that they do very similar things to the long-chain ones as well. So my question is, how are we all exposed? We find them in drinking water, either because they're near a place where they were used or they're getting there from our sewage treatment plants. We find them in carpets and fabrics. We find them in food packaging and food and pots and pans. Many of them are present on our clothing. Some of them are cardboard packaging. I've mentioned several times the eight triple F. And we just found within the last year that they can be present to pretty high amounts in different kinds of cosmetics were exposed to them. If they get into our food, we're exposed to them from by ingestion. If they're in our drinking water, we also ingest them. And you may not like the idea of this, but we're all eating dust all the time, especially our little ones who are closer to the floor and put everything in their mouth. But some of these compounds, when they're released or when they're heated, can also go into

the air, either as vapors or as fine to particulates in the air. And we can inhale them. And some of them can even get to us by getting on our skin. So there was a really wide range of health effects that we've seen from PFOS and PFOA. Now not every study finds the same things, but there are enough studies to believe that we're beginning to see the effects on going to mention, I should mention that essentially all these effects that I'm telling you I've been seen with PFOS and PFOA. We have also seen in our experimental animal models. So I'm not talking just rats and mice. I'm also talking monkeys. I'm talking birds, I'm talking fish. So some of the things we have seen that are associated with these compounds are testicular cancer and kidney cancer. We also see things like ulcerative colitis, which is an effect, an auto-immune effect impacting the immune system and come back to amino toxicity later. We're seeing some pregnancy-induced hypertension included in some evidence for preeclampsia. We're seeing, in many cases disruption of our thyroid system. We're seeing effects on our hormones in addition to the thyroid. So we have seen effects on our estrogens and androgens and testosterone, as well as some of our other hormone systems. There is growing data about impacts on the liver. I can tell you that in our animal models, the liver is always an impacted organ. And there was just a systematic review, a meta-analysis published just within the past month, really confirming the impacts on liver function in people were also some data showing impacts on increased risk of obesity and some data showing that type two diabetes may be increased. I mentioned the immune toxicity before. And in fact, what has been seen in a multitude of studies in different populations and with different vaccines is an inhibition of the vaccine response. And there's even some data that suggests that people who had higher levels of PFAS were more sensitive, more susceptible, and then more sensitive to COVID. There's some evidence for lower birth weight and size. For babies. There's evidenced for delays in puberty, decreases in fertility, and even early menopause in women. Then there is some evidence really not only for prostate cancer, especially if there's a family with an, with an elevated risk of prostate cancer, but also ovarian and bladder cancer as well. So what I like to leave you with is that these PFAS are multi-system and I should say multi-species toxicants. I said before, it's not just rats and mice, It's animals. Many animals throughout the animal kingdom, as well as people. And we're not talking about something that only affects men or women or only affects us during early life stages in, in, in utero or young children. But all stages can have effects. And essentially every organ system, at least in some models, has been shown to have an effect. So with that, thank you for listening, and I hope that this gives you a good introduction to the potential problems that we may all be there. Hi, I'm Phil Brown, University Distinguished Professor of Sociology and Health Sciences at Northeastern University and co-director of our pathos project. I'm going to give you some background on PFAS chemicals today. Current pi fluorinated chemicals, PFAS, are a very important set of chemicals. They are very persistent and bio cumulative in the body, which makes them a problem. And the recent pupil like them is because they repel water. So there are tons of industrial. As the ones that you know of are things like non-stick cookware, waterproof clothing, mattresses, carpeting, grease, food, food packages. But things you may not know about dental floss, cosmetics. And one of the things we've learned so much about recently, firefighting foams here, about 12,000 of these chemicals. And they've been around for a long time, discovered as early as 1938 and used in mass production as early as the 1950s. Unfortunately, there were decades of industry secrecy. Du Pont found evidence early on that these chemicals cause toxicity and animals. And then soon after that in humans, they found plight of workers was full of PFOA and indeed they were birth defects. Dupont took women workers off the production line instead of cleaning up the mess. Eventually, when DuPont found FIFO it and community drinking water, they failed to even disclose the results. And 3M couldn't even find uncontaminated samples anywhere in the world as comparison. There's a continuing expansion of

sources in the environment. So initially we saw production facilities and industries that use PFAS and then later firefighting foams. But more recently landfills, wastewater treatment plants and sludge food grown in that sludge food packaging and septic systems. And day-by-day new sources, chrome plating and other mental equating shops. Anything to do with oil because these are used to put out oil. Fire is a triple F. Firefighting foams. Artificial turf now is a major source. We're finding P facet of all sorts and pesticides and plastics and in dry cleaning, affected residents are very central to the discovery action in science on PFAS. The tenant family had a farm and they sold land to DuPont, which dumps 7,000 tons of PFOA. All their cows died. And the resulting list suit not only lead to find EPA, but the class action suit led to a major health study that we call the CHI Health Study. And many of the first health effects that we learned about came from this word. You'll hear much more today about those. It's important to understand that community groups have been very central to toxics issues ever since Love Canal in 1978. And they have been taking lead on PFAS. They've raised public awareness to make this a national issue. They've gotten bands and regulations. They've helped journalists to write about it. They put medical monitoring and medical education on the table as key needs. And they've collaborated with scientists to create new research. What are the concerns that all communities have when they find that this p fast? What are those health effects and what should we do about it? Who's going to tell us if it costs are illnesses? How can we get monitoring to follow this up? They want and other sources. Where is it? How did it get there? Who's responsible? And they won't have a response to tell them how to get blood tests would attest who will pay for that? How can they avoid exposure? They want to know if government and health departments in medical professionals are doing or failing to do. They want to clean it up. They want to know who's going to pay to clean it up. And they want regulations and dance. Hopefully this introduction gives you a good background. And I thank you for your time. In 2017, I learned that my drinking water, the drinking water my husband and I used for 25 years had been contaminated by PFAS. My home was across the street from a Christmas tree farm, but that was actually had been a dumpsite for tannery waste from Wolverine Worldwide. And my husband and I had no idea of that. I actually learned about this a year after my husband died quite suddenly from liver cancer. I was told by our Department of Environmental Quality that I needed to test my water for PFAS. My water came back initially at 38,000 parts per trillion, which is much higher than the EPA health advisory of 70 parts per trillion. We drank that water for 25 years. I had asked at my blood tested, but I was told by the health department and just various state agencies that there was no need for that. Luckily, my lawyer helped me find a place that would do testing. And while it was quite cumbersome, eventually I learned that I had PFAS levels in my blood that were over 5,000 parts per billion. As a lay person, these numbers mean nothing and I had no way to put this into perspective. So I made an appointment with my primary physician. And frankly, he looked as puzzled by this as I did. But the steps you took next really made all the difference. I remember the appointment because he politely excused himself and then returned with the information on PFAS from the ATS SDR. I had already found that information and was pulling it out of a folder at the same time. But I felt that he at least had heard me, he had recognized the importance of what I was saying, and he was taking steps to find out information. And that was really key for me as a patient. but we reviewed it together and we agreed that the next steps would be one not to panic. I'm too I would do whatever I could to reduce further contamination. And three, we would do some monitoring of those issues that were identified and research already. This meant maybe some extra labs at my annual physical monitoring, kidney function, thyroid function, etc. He also added an exposure to environmental toxins as a diagnosis and my chart so that other health providers would take this seriously as well. Then we fast forward to 2020. I began having some just benign symptoms that we

talked about it my physical just some shortness of breath that would come and go clearing my throat. Weird sensations in my throat and neck. We first rolled out just the easy things, allergies, gerd. But the next appointment, my physician said, typically this would be about 20th on the list. But given your high PFAS levels, the prudent thing to do would be to rule out any problems with your thyroid? I had an ultrasound and it was found them that I had thyroid cancer, which it actually spread to some lymph nodes. And as a result, I had a total thyroidectomy in 23 lymph nodes removed. And I also had Radiation, radioactive iodine treatment, and now I'm continuing to be monitored. I was very fortunate to have incredible attentive doctors and medical staff here working with me. I had a medical team that included me. The patient is really part of the team. They provided me with information that was really clinical and relevant. They found a really good balance between reassurance. Reminded me that this doesn't predict anything technically in the future, but also realism that it was something that we had to be aware of. We talked about the research to date and we continued to talk about that. Every time I have an appointment, they used my levels as part of any medical history just like you would any smoking, any history of diabetes, any other environmental exposure. And they validated the concerns I had. They didn't discount my worries or minimize them, but they explain them in good clinical terms. I'm very excited that we're doing these trainings and I hope this information helps doctors moving forward when they have patients like me. So thank you for taking the time to watch this. My name is Elizabeth Freeman. I am a primary care physician at Children's Mercy in Kansas City. I also work as well, director of the Environmental Health Program and also is the director of the mid america pediatric environmental health specialty unit, or PC for short. The pesos are a national network of experts in the prevention, diagnosis, management, and treatment of health issues that arise from environmental exposures from the time of preconception through adolescence, dedicated to providing consultation and training for health professionals and the public on environmentally related health effects in children. Pfas are considered an emerging chemical class. This means there's a lot, we still don't know about them. What we do know from toxicology studies, modeling, and epidemiologic population-based studies is that expulsion to them is correlated with health effects. We still don't know the amount or dose that would be considered harmful. How long someone would need to be exposed to be considered at risk for harmful effects. Bioavailability. We do have a way to test for them with blood testing for a handful of them. Although, like previous speakers have mentioned there at least 12,000, 12,000 of these chemicals and still more are being produced. It takes a long time to learn this information. Some of the questions we ask and research and exposure science and an exposure medicine are how much is too much is a little bit of exposure. Okay. But not a lot. How long between the time of exposure and onset of symptoms, how long did the chemical standard system, how do we metabolize them, if at all? Do we eliminate them? How do we eliminate them? Do different types have an additive effect or different effects altogether? Should we wait until we have proof of harm of every chemical type and then the known amount that cause harm before taking action. Many environmental health experts would say no, that we have enough information to make informed decisions about how much of these chemicals PFAS, we should allow in our environment. Which brings me to the precautionary principle. This statement implies that there is a social responsibility to protect the public from exposure to harm when scientific investigation has found a plausible risks that the burden of proof should not rest with the public as it does now, which ultimately shows adverse outcomes once the chemical is in the environment when it's too late to prevent exposure. Let's consider a well-known environmental hazard like lead. We have known lead was harmful to some degree for millennia. Yet today we're still trying to remove it from our infrastructure. And while we do this, we monitor blood levels and children and in adults who could be

explosive the workplace. And then after we found someone who's been exposed, then we intervene. Another interesting point that might add some perspective is the difference in how we approach pharmaceuticals and chemicals. Pharmaceuticals are considered unsafe until they're proven safe. But we don't apply this process to chemicals. We use an encounter in everyday life. The last point I want to make with this slide is that for many PFAS, for the ubiquitous one's, someone say we are well past the precautionary principle that we know enough to remove them from industry. But then what about the other thousands that may differ by a few molecules? Do we still allow those? These are some of the issues that we talk about an exposure science. The effects of PFAS exposure are still being discovered mostly based on these ongoing toxicological epidemiologic studies. And the ongoing need for additional research does not need to be a barrier to understanding that the weight of evidence from human population and experimental studies supports PFS health outcomes. We'll talk more about this momentarily. The chemical group of PFAS has been identified as having adverse health effects. A wide range of people are approaching their health care professionals with concern about known and potential exposures. Physicians and nurses are still some of the most trouble professionals. There's also a need for physicians, nurses, and other allied health professionals to have sufficient knowledge and resources to respond to patient concerns. There's also a need for health professionals to recognize the value of medical surveillance. For us to be able to provide effective risk communication for individuals both with perspective and known exposures. There's also a need for us to recognize the importance of timely intervention to minimize adverse health outcomes and eliminate exposure. Here's another case example to reflect some of these things. Thank you. My name is named Barbara and I had been a firefighter for the last 15 years. Over those years, I had multiple exposures to PFS and a triple F and firefighter turnout gear. We regularly trained and used phone during fire suppression and drills as the municipal firefighter. We also trained with airport firefighters with h triple F. Every day I worked at the firehouse. I was also exposed the protective gear that I wore, the gear had multiple layers that contain PFAS and all of them. Two years ago I found a lump on my ******** that turned out to be cancer. I was diagnosed with semi-nomadic that spread to the lymph nodes and my abdomen. I received an archae ectomy and radiation to treat the spread at Mass General Hospital. Shortly afterwards, I researched causes for testicular cancer and came up with a link to PFS. Testicular cancer is common in the fire service, in common with PFAS exposure, the fire service also has higher rates for prostate, kidney, and liver cancers than other occupations. The use of PFAS chemicals in the fire service was not only heavy, but also consistent. Every day we want our gear, we expose ourselves a little bit. Every time we use and handle the phone, we expose ourselves in high doses. Imagine taking buckets of PFAS and dumping it into trucks and then spring it all over an area you are working in. These exposures to the fire service are still ongoing and have been accepted tactics by the fire service for years. We were even told in the early training days over a career that H MLF is just like Dawn dish soap. No point where firefighters given any guidance on managing, handling, replacing, or the health issues connected to a triple F or their gear. There were no warning labels are safe handling protocols follow. Firefighters eat, sleep, work and exercise and firehouse that is suffused with PFS us forever chemicals are on every surface they touch. We need to look at where we are. Avoid any unnecessary exposures, PFAS to protect our 1.2 million firefighters that protect us. So keep this in mind when you see a young, healthy firefighter in your office, they may think they are invincible, but in reality, their health has been compromised due to exposures at their workplace. Thank you. Hello. I'm Alan duck in it. I'm a clinician and internist and an occupational physician. And I've spent most of my career doing that medical monitoring. The goals of this lecture are to discuss. Medical monitoring as it pertains to PFAS. And we're going to focus specifically on a couple of

different guidance recommendations that pertain to clinician information. A bit about my declarations. I'm a researcher. I have something like 40 PFS publications in the peer review literature. And my history with PFAS goes back to my experience, first experiences in the United States Navy when a group of men with testicular cancer with extraordinary exposures to one of the PFAS, PFOA and to another chemical di methyl forum ID had an outbreak of time of testicular cancer. And we followed up at another place with the same processes and procedures and detected another excess of testicular cancer. And I helped design the CA, health study. But the thing you need to know most about is that I have a potential conflict of interest. I have collaborated with entities interested in obtaining medical screening in communities that were affected by high PFAS exposure, both as a volunteer and as a paid consultant AT SDR, the Agency for Toxic Substances and Disease Registry, a small and seriously underfunded, but mighty and intellectually important part of the federal government has the best criteria for when we do medical monitoring or medical screening, consisting of descriptions of what the exposures need to be, the outcomes. Whether or not we can do something that's beneficial, called early detection. And then a comparison of benefits and harms. And this is what they say actually in the Code of Federal Regulations from 1995. That's the reference for it about why the exposure level is sufficient to consider medical monitoring. And it boils down to when there is an exposure that is above a documented level where there is some adverse health effect, which can be either an important health change or even in some instances, a change in a biological marker of effect if there are indeed other effects that exists for that outcome. The implication for preventive services is that medical monitoring is at most a secondary and just as often a tertiary form of prevention. We're not talking about preventing exposure. We're not talking about preventing the things that cause disease. We're talking about early detection and early intervention in an effort to either intervene in the disease process or more commonly mitigate it. And of course, for that process dose matters. We're talking about individuals with known exposures, again above some threshold. Now, for PFAS, common patient concerns are the health outcomes such as cancer or any effects on human development or stress. Patients sometimes talk about lost property values, the difficulty of maintaining filtration if they have contaminated water. The guilt concerning the years, the day where their children are wider family may have been exposed and the patient calls are obviously going to be our assistance, our clinical assistance in getting them both. That's secondary and tertiary prevention of medical monitoring, but also primary prevention. They're asking for our advocacy in getting them clean water. To the degree that we know that health outcomes are attendant to exposure in water or in occupations or any other type of exposure for that matter. They may also ask us how they get tested. That's part of medical monitoring and we'll come back to that after my lecture. They want to know what they can do to decrease their health risks. And they may even ask us what they want we as clinicians can do to remove internal contamination. This lecture is not about that, but it turns out there actually are some theoretical things we can do. Serial phlebotomy. As an example, the medication cholestyramine is another example. However, we don't have clinical trial level guidance that either of those things is a good thing to do. We only know that we can do them and we know that they do remove PFAS from blood. We do not know that there are benefits outweigh risks. They are topics for discussion with very concerned patients and high exposure levels situations. When we talk about PFAS health outcomes, we have a taxonomy. As clinicians about levels of evidence. We may say things like substantial, moderate, or at or above. We may say more likely than not. And scientists who make recommendations in parallel to clinicians may use the words sufficient for very substantial evidence and limited or suggestive evidence for ADA or above equipoise. That is to say something that is somewhat or more than somewhat more likely than not to be the case based on epidemiological and or toxicological

evidence. The first such postings for PFOA back in circa 2012 to 2015, were the probable link findings by the CH science panel. These were three epidemiologists in that vast 69,000 people study that I helped to design, but I was not a member of the science panel. I collaborated with them, but I was not one of the three signs panel epidemiologists. And their findings were that there was excess hypercholesterolemia, thyroid disease, ulcerative colitis, testicular cancer, kidney cancer, and pregnancy-induced hypertension. The footnotes that I've placed next to them, the ones suggests that we have markedly increased evidence since they made their determinations. And the two suggests that we have some caveats or specific sub-populations rather than entire populations that we may be concerned with for ulcerative colitis and thyroid disease. Others have posted their outcomes on which they've made health determinations. California has said these health outcomes in humans are critical to their thinking for PFOA and PFOS, the two most common contaminants in the United States to be seen in human serum and to contaminate water districts. These include things I've already mentioned, plus immune system toxicity, which is a very important outcome of PFAS exposure. And they also talk about health effects in animals. My view, there's very strong evidence for things that left-hand box immuno toxicity and lower vaccine uptake with concern, but not definitive concerned about COVID specifically and COVID immunizations, lipids, for sure, kidney cancer, liver, including higher transaminases and steatosis, thyroid binding proteins, uric acid and lower birth weight. And then there's substantial evidence for other outcomes which are in that central box, but which are considerably more likely than not, then at or above equipoise on the right with a longer list of outcomes. And breast cancer is one that the National Academy of Science, which I'll talk about more, has now endorsed as a linked outcome. These determinations are not based on. We sat down and thought about it for a little bit and here's what we came up with there based on multiple epidemiologic and or toxicological investigations, including physiologic in vitro investigations. The population evidence examples just so you know that we're talking about a lot of work in some cases is that there are more than 20 populations and probably more than 50 studies involving lipids. Not all are positive, but the vast majority are for livid, for lipid, for liver, it's more than ten different populations at this point. And in addition, there is now a very powerful analysis that was just published in Environmental Health perspectives for kidney cancer. The most powerful study is an NCI, National Cancer Institute nested case control study design within a longitudinally followed population, which showed an appreciable risk that was hot as high as two-and-a-half times higher than background. And the fourth quartile of exposure and insulin resistance, where that's an example of where we have conflicting evidence. But it looks to me like the future is problematic for that one as well. And we'll stay tuned. But I think we need to follow insulin resistance very carefully from PFAS exposure and there is federal monitoring guidance for peace, and it comes from the agency I've already mentioned AT SDR. the pond to the National Academy of Science, which then in panel, a group of hardworking, volunteer, very expert individuals with a wide range of expertise ranging from PFAS in some cases to clinical care and other cases to toxicology and others. And they in panel them to listen to community members, to scientists at a group of meetings, and then to review the literature and to make recommendations about what should be done for communities. Now, there are all were already some other templates for evidence-based patient communications and even medical monitoring that we're on the web. The C8 science panel recommendations were followed by a medical monitoring program in the mid Ohio Valley, which you can find on line, PFAS reach, which is a non-profit collaboration between this Silent Spring Institute in association with Northeastern University and others, has a very useful group of fact sheets, including useful lab tests, which can be found also on the web. And now, just as we are giving this lecture in the past week, the National Academy of Science, that hardworking group of

wonderful volunteers has come up with their recommendations, which are recommendations to 80 SDR, which are essentially AT SDR. Here are some things for you to consider. What the National Academy of Science is advised is clinicians should do and exposure assessment. Of course, that's near and dear to the hearts of Occupational physicians such as me. And that includes asking about drinking water in your community and occupation, which makes perfect sense. They also advise primary prevention. Just as I've already discussed, clinicians can advise about water filtration, but they can also get involved in community approaches which are much more effective if possible, then doing it at the individual level. And in fact, a several concern I have is that National Academy of Sciences addressed what to do if you have your own individual well, but as far as I can see, make specific recommendations about the very high desirability of getting water into those communities. That filtration essentially forever isn't the only alternative because forever filtration is not an easy thing to do. Of course, clinicians can advise about wildlife advisories and then about infant food sources, such as a heavily contaminated mom, because these things do pass to the fetus or breast milk. Nassim will also advised about education and they, one of their advice is that the Agency for Toxic Substances should support clinicians with educational materials, which since the Agency for Toxic Substances already did that, I think applies that they should supply change that educational materials and I assume some changes in what agency, what ATS DR. now has on the web will be forthcoming because there are already much better recommendations, including what can be gleaned from the National Academy of Science. The National Academy of Science recommended, as did PFAS reach that there'll be internal exposure assessment that is that we measure the PFAS in the individual's blood if the individual is a member of a community or an occupation with known exposure. And National Academy of Science listed V7 fast, which can be summed to consider if additional medical monitoring is that appropriate. And they further pointed out that any sum today may be lower than the sum in the past. So that one should consider past exposures in communities where the levels have been declining because PFOA and PFOS have essentially and PFOA and PFOS access have essentially come off the US market to a large degree in terms of contamination, although they may still come back, come back into the company country in products. This is what the C8 medical monitoring program in that heavily contaminated mid Ohio Valley Community does. This just gives you an example of what medical monitoring can look like in a heavily contaminated community. This has been going on for about seven or eight years now. This is what PFAS reach, recommends. They have some wonderful fact sheets, more examples of fact sheets. This is what it looks like on the web. This is their advice to community members and their advice to clinicians. So these are the laboratory tests in the guidance for pediatric patients and the PFAS reached guidance which include the lipid panel, liver function tests, thyroid tests, clinical examination for those that wanted for regular testicular exams in the appropriate exposure population. And then counseling topics such as vaccine response, endocrine disruption, which obviously includes the consideration of breastfeeding. Similar guidance for adult patients. Breastfeeding obviously belongs in the adult category. This is a head-to-head comparison of what PFAS reach said and what Nassim said about outcomes and then related medical monitoring that can be done for outcomes. It's interesting that when nasa made a recommendation for, yes, this causes the outcome, it was either something that is already recommended as a screening outcome or something like ulcerative colitis, which presents as a disease and is not terribly amenable. Whereas PFAS reaches more likely to be more proactive about things for early detection can make a real difference in the disease course of an individual. Especially for a disease like nonalcoholic fatty liver disease, which is the very likely underlying mechanism for both the higher cholesterol and the higher uric acid and the higher alanine amino transferase and other transaminases of PFAS exposure. That is the thing that liver difference than I think

most needs to be clarified about the difference between National Academy of Sciences and PFS reach. I believe that PFAS reached, got it more right. I think the National Academy of Sciences had a process in which they hadn't considered that latest, made it analysis which really nailed down the degree to which liver problems are elevated in the presence of PFAS. And if one isn't a higher exposure community, it's 15-20% more likely to have ALT e.g. that is outside of the norm, much less outside of the norm for one of the clinically derived screening things such as the fib four, which many clinicians. Are familiar with, so I actually uses the AST. But anyway, the point is that I think that liver screening will be increasingly recommended in the future and PFS reach already does that. Guidance on breastfeeding. It's important for you to know that we still recommend breastfeeding in virtually all instances including and contaminated communities. But when we make that recommendation, it is important that we be really open with our patients and with communities that that recommendation is based on a default position. We know so much about the benefits of breast-feeding, and we're only learning about the infant incremental problems Of heavily contaminated breast milk. So that we really don't know where to come down on this with absolute certainty. And our default position is that we generally recommend breastfeeding and we should be honest it's a default because that lets our patients participate with us and feel more comfortable with our recommendations. And some of them may still not want to breastfeed. And so long as we've discussed our recommendations with them, we can be supportive of them either way. A final reminder, the health outcomes affect all of us. Pfas are remarkably physiologically active, even though they are forever chemicals in the environment. In US, they are physiologically active, not metabolized all that much but active. And they change our physiology a great deal. But the screening process, medical monitoring is something we recommend only for those in a substantial exposure. And the National Academy of Sciences recommended that that consideration begin when the sum of those seven common PFAS is above two at present or may have been in the past, and that's going to be a fair number of people. And for those above 20, I think the recommendation becomes even stronger and that will still be a fair number of people. And we're talking there about parts per billion human serum. Very low levels, physiologically strongly active. And I thank you for your interest. And for those of you who have individual level questions, I'm easy to find and I wish you the best and hope that you too will have the privilege of participating in helping patients face this problem. Hi, I'm Jamie on cow. I'm the co-founder of the PFAS action group. After learning about PFS or my community work and reading countless articles and studies, I decided to see just how much pizza as I had in my blood after consulting with my primary care physician and providing them with the clinician guidance documents from PFS reach. I was able to discuss the importance of the test and ultimately convinced them to authorize the lab order through Quest Diagnostics. I want to make a note that it did take some discussion and a lot of research on my end to provide my Dr. with the information they needed to feel more comfortable about approving the blood work. And I appreciate their willingness and respect for my desire to better understand my personal exposure to these chemicals, which resulted in them ordering the test. A few weeks later I received my results and my physician was honest and open about not knowing how to interpret them or what they meant. But we discussed published studies on health outcomes. And we're able to develop a plan for future monitoring as well as discuss exposure reductions. Additionally, having my results gave me a baseline to work off of an illustrated how my levels compared to the national average provided by the National Health and Nutrition Examination Survey or NHANES data. Since learning of my levels, I've made changes in the products I purchased, have installed water filtration in my home and we'll continue to monitor health conditions associated with PFAS contamination with my physician. At the end of the day, having clinicians such as yourselves

understand the implications of PFAS contamination and be willing to learn and advocate for your patients. Pfs will be instrumental in empowering patients like myself with information on our exposure levels. Thank you so much. Hi, my name is Laurel shader. I'm the senior scientist at Silent Spring Institute. We're a non-profit independent research organization focused on understanding links between everyday chemical exposures and health. With a particular focus on women's health and breast cancer prevention. My own research focuses on exposures to PFAS and other toxic chemicals through drinking water, food, and consumer products. And how our health is affected by these exposures. Today I'll be talking with you about PFAS blood testing. When PFAS blood tests are appropriate. What we can and can't learn from a PFAS blood test, how to interpret the results of these tests. And some helpful information for you if you're looking into ordering PFAS, blood tests for your patients. Health agencies such as the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry have typically thought of PFAS testing as most helpful as part of scientific investigations or health studies. However, a recent July 2022 report by the National Academies of Science, engineering and Medicine. Recommended that clinicians should offer PFAS testing to patients who are likely to have a history of elevated exposures. There are a variety of reasons why individuals who have elevated PFAS exposures may want to seek out PFAS blood testing. These tests are useful for providing an indication about each individual's personal level of exposure to PFS. This information can inform medical care. For instance, people with higher than average exposures to PFS may seek out certain types of medical screening. Health effects linked to PFAS exposure. Results of PFAS blood tests are also a useful baseline or comparison for future tests to look for trends over time. For instance, if a source of contamination in the environment is removed or if an individual take steps to reduce their own exposures, it's helpful to see if their levels do in fact change over time. Finally, having the results of PFAS blood testing is useful for potential future research studies because this would provide an indication of exposures closest in time to when contamination is discovered. It can be scary for patients to learn that they have elevated levels of PFAS in their blood. But from what I've learned, talking to PFAS impacted communities, having this information is important and empowering for communities. And in this case, ignorance is not bliss. A PFAS blood tests provides an indication of the levels of PFAS, a person's blood at the time of the test. For some PFAS, chemicals like PFOS and PFOA. These are chemicals that can stay on our body for years. So the result of the PFAS blood test provides an indication of exposures over an extended period of time. Newer PFAS chemicals stay in our blood for shorter amounts of time, like weeks to months. And so PFAS blood test results will provide an indication of exposures to these chemicals over shorter periods of time. The results of these tests can answer questions like, are my levels of exposure higher than the general population and our levels in my blood higher than other people in my community. There are limitations to what we can learn from a PFAS blood test. We can't know for sure where the PFAS in a patient's body came from and how they got exposed. We also don't know how long the PFAS have been in a patient's body. Patients may wonder whether a health condition they're experiencing is related to their PFAS exposure. But the PFAS blood test can't answer that question. Finally, we can't know for sure whether a patient will develop certain health conditions in the future related to their PFAS exposure. How do we interpret the results of PFAS blood testing? One helpful resource is the Center for Disease Control and Prevention's enhanced study. Nhanes stands for National Health and Nutrition Examination Survey. And this includes testing of PFAS levels in a representative sampling of Americans. So it's very useful for comparing an individual's results to the general population. In communities that have PAD PFAS blood testing. You can also compare your patients results to typical levels in that person's community. The National Academies Report in 2022

recommended additional clinical screenings based on specific ranges of PFAS, chemicals in people's blood. Our own team from the PFAS reach study has developed a tool called what's my exposure? This is based on Silent Spring Institute, extensive research into effective methods for chemical report that the tool allows users to enter the results of blood tests and provides graphics and text to put those results into a context. The tool also provides exposure reduction tips, which help people feel empowered to use the results to protect their health. You can also use the tool to interpret the results of PFAS drinking water testing too. If you're looking into PFAS blood tests for your patients, Here's some information that you might find helpful in terms of specific codes to use. You can use ICD ten code z 13 88, which is specific for screening for disorders due to exposure to contaminants. On the screen you can also see the test and CPT codes for quest laboratories. There are currently a handful of other laboratories in North America that also offer PFAS blood testing. Some of these tests for a wider range of individual PFAS compounds. So they can provide more information about a person's total PFAS exposure. Labs also can differ in their detection limits, are reporting limits. Tests that have a lower detection and reporting limit or more sensitive and will provide more information about lower levels of PFAS in a patient's blood. Finally, a word about chemistry. Chemicals like PFOS and PFOA can be present in the environment and in our bodies as a mixture of very similar related chemical structures called isomers. Some tests look for both linear and branched isomers. And that provides a more complete assessment of the level of that specific chemical in a person's blood. Other tests only look for linear isomers. With those tests we're only seeing a portion of the level of that chemical in a person's blood. It's important when you're making comparisons to N Hanes or other datasets that you're making the right comparison and comparing linear results to linear results or total to total. Your patient may also have questions about insurance. Currently, New Hampshire is the only state that requires insurance providers to cover the cost of PFAS blood tests. In other states, you may want to have your patient check with their insurance to confirm coverage. Finally, if your patient is working with an outside laboratory, they may have extra challenges related to phlebotomy as well as shipping and handling of blood samples. As an alternative, there is one commercial laboratory that offers an at-home finger ***** test that some people may find helpful alternative. For more information, please visit our PFAS Exchange Website. On the right you can see a general guidance fact sheet with information that you and your patients may find helpful when considering ordering PFAS, blood tests. And on the left, you can see a link to our online resource, which provides information about specific chemical testing laboratories. Thank you for learning about peace. Hi, my name is Courtney Carignan, I'm a PFS researcher at Michigan State University and I'm going to share some resources that you may find helpful. An area of high need identified by community members and their clinicians is medical screening guidance that's concise and then a format that patients can use to encourage two-way conversations with their Dr.. So we developed a guidance in collaboration with scientists who presented earlier in this training that was also reviewed by physicians and scientists on our advisory board, as well as by members of PFAS impacted communities and communications professionals are resulting guidance is a set of companion documents for community members and their clinicians that includes science-based information about health outcomes linked to PFAS exposure, as well as suggestions for medical screening that includes a list of potentially useful clinical laboratory testing. Here's a list that includes our guidance and several others. Other guidance you may find helpful or from the pediatric environmental health specialty units, the National Academies Report, and of course, the medical monitoring program developed by the C8 science panel as PFS are immuno toxicants, There's concern among PFS impacted communities that they may be more likely to develop a severe illness and that their bodies may not produce sufficient antibodies from vaccination or natural

infection to help protect them. We were approached with these concerns towards the beginning of the pandemic and we're asked by our partners and impacted communities to help publicize these concerns. So people with exposures could use that information to inform their decisions. E.g. someone may decide to mask and be vaccinated if they knew that their risk of severe illness may be increased. There is now emerging evidence of a link between PFAS exposure and increase susceptibility to COVID-19. And many studies are underway. In addition to sharing this information via the press, we developed to fact sheets that review what is currently known on these topics. Like our other facts sheets, these can be found on the resources page of the PFS exchange, a website. People will likely first approach their primary care physicians with these questions. We are doing our best to provide information that is helpful. Here's a list of medical and public health professionals who may also help understand a patient's exposure and recommend next steps. Of course, we know that most medical professionals receive little training and environmental health and that training they do receive is often limited to understanding exposures and interventions for lead, smoking and air pollution. Lead is currently the only contaminant that is easy to test and serum and even mandated for children and many states, there's a need to update the training clinicians receive to reflect advances in knowledge, including that understanding and documenting somewhat exposure can be helpful even when there is currently no clear treatment. You can help protect your patients from PFAS and other contaminants by supporting patient autonomy and shared decision-making. Supporting local and national actions for clean water and food supply. Joining our new PFAS listserv for clinicians by sending an email with a subject line, subscribe to PFAS and patient care at MSU dot edu. And when you do so, please tell us your name and credentials and why you are interested in PFS. Finally, there are many resources on PFAS that can be helpful to you and your patients. These include the medical screening guidance and professionals I mentioned before, as well as a calculator that will estimate PFS and serum using levels and drinking water. Also, scientific studies, information and news. Water filters. Worker health and safety, technical guidance, community resources and information about chemical policy. Thank you so much and please feel free to reach out if you have any questions. This concludes our non-stick nuisance medical monitoring for PFAS webinar. We hope you have found this information helpful. Thank you.