Stenographic Transcript
Before the

Subcommittee on Personnel

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

TO RECEIVE TESTIMONY ON TRAUMATIC BRAIN INJURY
AND BLAST EXPOSURE CARE

WEDNESDAY FEBRUARY 28, 2024

Washington, D.C.

ALDERSON COURT REPORTING
1029 VERMONT AVE, NW
10TH FLOOR
WASHINGTON, DC 20005
(202) 289-2260
www.aldersonreporting.com

TO RECEIVE TESTIMONY ON TRAUMATIC BRAIN INJURY AND BLAST EXPOSURE CARE

Wednesday February 28, 2024

U.S. Senate
Subcommittee on Personnel,
Committee on Armed Services,
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:59 p.m., in Room 222, Russell Senate Office Building, Hon. Elizabeth Warren, chairman of the subcommittee, presiding.

Subcommittee Members Present: Senators Warren [presiding], Blumenthal, Hirono, Kaine, Ernst, Sullivan, Scott, and Budd.

OPENING STATEMENT OF HON. ELIZABETH WARREN, U.S. SENATOR FROM MASSACHUSETTS

Senator Warren: [Technical problems.] This hearing will come to order. I am pleased to welcome you all to today's hearing to receive testimony on the Department of Defense's efforts to protect servicemembers from blast overpressure.

Servicemembers put their lives and their health on the line when they are -- [technical problems]. In return, we have a profound responsibility to make sure the nation is doing all we can to keep them safe, to prevent battlefield and training casualties -- oops, thank you.

[Technical problems.]

Senator Warren: That could be trouble. All right. Good. Did we get the other on the record? Just so, I got started here. Servicemembers put their lives and their health on the line when they put on their uniforms.

And in return, we have a profound responsibility to make sure that the nation is doing all that it can to keep them safe, to prevent battlefield and training casualties, and to provide the best possible care for those who are injured. We are holding this hearing --

[Technical problems.]

Senator Warren: We are there? Good. We are holding this hearing because DOD is not meeting its

responsibilities when it comes to traumatic brain injuries and other injuries that result from firing weapons.

Injuries from blast overpressure, the pressure that is caused by a shock wave that exceeds normal atmospheric values, have been the signature wounds of the wars in Iraq and Afghanistan.

But there are also injuries incurred in training here at home. They are invisible, but they affect thousands of servicemembers, causing headaches, seizures, hallucinations, and ultimately significantly increased risks of depression and suicide.

Over the course of just three months in 2023, DOD provided TBI treatment to servicemembers nearly 50,000 times. The more we learn, the more we come to understand that blast exposure is an ongoing threat to the health of individual servicemembers, and to the well-being, the morale, and the readiness of our entire force.

I appreciate the support I have had on this issue from Ranking Member Scott, from Senator Ernst, from Senator Tillis, and from other members of this committee. I secured a long term study of blast overpressure injuries in the 2018 National Defense Authorization Act, and I have worked with Senator Ernst to introduce legislation on blast overpressure and to secure additional requirements to track blast overpressure injuries in the Fiscal Year 2020 NDAA.

DOD is working to implement this legislation, but we still have significant problems. Last year, The New York Times reported on heightened brain injury risks for U.S. troops in Syria fighting ISIS. Four artillery batteries assigned to the region fired more weapons than any military American artillery since the Vietnam War.

The result was that each of these units had members with serious blast overpressure injuries, and each had at least one member that committed suicide. These deaths are a tragedy. Ryan, a Navy SEAL deployed to Iraq and Afghanistan, was subject to significant blasts from his own weapons over the course of his career and later died by suicide.

His father, Mr. Frank Larkin, is here today to discuss the harm that blast overpressure has caused to servicemembers and to their families. The Times also revealed that even when DOD had made policy changes to address risks, those changes were not evident on the ground. Weapons known to deliver shock waves well above safety thresholds were still widely used. Training did not involve basic safety measures, and special operations forces were not issued blast exposure gauges, the gauges that are needed to track the threats they faced.

So, DOD and Congress both have a lot to do. Here is my agenda to address this problem. First, we need to

establish mitigation strategies specific to the service member roles that are most at risk for blast overpressure.

Second, we must require DOD to create blast exposure and traumatic brain injury logs for all servicemembers and to integrate these logs into their VA and DOD health care records. Third, the Department of Defense should partner with innovative, evidence based programs like Home Base to help servicemembers get the care they need. And I am going to have to brag here for just a minute.

Home Base is a nonprofit organization founded by Massachusetts General Hospital and the Boston Red Sox to take care of the invisible wounds of veterans, servicemembers, military families, and families of the fallen. Home Base has clinics in Massachusetts and in Florida, Ranking Member Scott's State.

Home Base has a comprehensive brain health and trauma program specifically designed for special operations veterans and servicemembers, where it has been leading innovative treatments for veterans with co-occurring substance abuse and mental health conditions.

As we work through this year's NDAA, I want to support this program's work, and I appreciate Dr. Zafonte from Home Base joining us today. One more item.

We need to make sure that DOD sets a threshold on the maximum number of rounds that is safe -- that

servicemembers can safely fire, and that this includes consideration of exposure limits over an extended period of time. DOD must do its part and Congress must do our part.

So, to our witnesses, welcome and thank you for appearing. We are going to have two panels today. The first panel will consist of outside witnesses to provide their perspective on where DOD and the services are falling short on protecting servicemembers from blast overpressure.

Dr. Samantha McBirney Professor of Policy Analysis at the Pardee RAND Graduate School, Dr. Ross Zafonte, Chief of Traumatic Brain Injury and Health and Wellness Programs at Home Base, and Frank Larkin, Chief Operating Officer of Troops First Foundation and lead of the National Warrior Call Day Initiative.

The second panel will consist of officials from the Department of Defense and Walter Reed to hear how DOD is tackling this issue. We will have Dr. Lester Martinez Lopez, Assistant Secretary of Defense for Health Affairs, Kathy Lee, Director of Warfighter Brain Health Policy at DOD, and Captain Carlos Williams, Director of the National Intrepid Center of Excellence at Walter Reed National Military Medical Center.

I will now turn to ranking Member Scott for his comments to open this hearing.

STATEMENT OF HON. RICK SCOTT, U.S. SENATOR FROM FLORIDA

Senator Scott: First, I want to thank Senator Warren, the chairwoman of this committee and -- our subcommittee and thank her for caring about this issue and for taking this job so seriously. Chairwoman Warren, I want to thank you for holding this hearing on such an important topic.

Traumatic brain injury, or TBI, is one of the most common injuries sustained by American servicemembers. In 2022, more than 20,000 military personnel were diagnosed with TBI. Stop and think about that for a second. Just in 2022, there are more than 20,000, 20,000 members of military that were diagnosed with a traumatic brain injury.

That is pretty bad. The vast majority, over 84 percent, were classified as mild, which is more commonly known as a concussion. But if any of us have -- when you have raised kids and they have a concussion, it scares the living daylights out of you.

Missing from this data are servicemembers who are frequently exposed to low level blasts that do not typically result in a clinically diagnosable concussion. This is concerning because repeated exposure to low level blast may cause similar symptoms as more severe cases of TBI.

We know that low level blast exposure from fire and

heavy weapons systems or explosives may cause a variety of symptoms including concentration, memory problems, irritability, headaches, and decreased hand-eye coordination. Each of these issues alone can be very serious and disrupt somebodies life.

Unfortunately, there remains a great deal about exposure to these blasts that we yet do not know. More research and better data are required so that military and health care providers can mitigate the frequency of blast exposure where possible and treat those exposed to blast where necessary.

We have actually taken action to do that. In the 2018 National Defense Authorization Act, Congress required the Department of Defense to conduct a medical study on blast pressure exposure.

Two months ago, the committee received the Department's final report on this study. This hearing presents an opportunity to assess the quality of the Department's work. The legislation required the study, which followed specific individuals over an extended period of time, to include three specific elements.

First, the Department was to "monitor, record, and analyze data on blast pressure exposure" for any service member "likely to be exposed to a blast in training or combat." Second, the study was to assess the feasibility

and advisability of including blast exposure history into a servicemember's medical record.

Last, the Department was to review the safety precautions of heavy weapons training in light of emerging research on blast exposure. In reviewing the final report submitted this past December, it is clear the Department still has more work to do, particularly in its ability to monitor and record blast exposures for military personnel.

Only a few hundred soldiers and Marines were fitted with wearable devices that unfortunately seem to suffer from quality control issues. And while the Department's report does say that it may be feasible to record blast exposure information in a servicemember's medical record, a business case analysis is required to determine the way forward in this area. In this hearing, I would like to learn more about how the Department plans to conduct this business case analysis.

This is an important issue. I believe the Department is committed to getting this right and I believe the TBI Center of Excellence and Warfighter Brain Health Initiatives are excellent initiatives that I hope will provide the military with the information needed to better understand the effects of repetitive blast exposure.

We all must remember the exposure to low level blast will continue to be a necessary risk for many of our

frontline combat troops. But if we can do better -- if we can better quantify the type and number of blasts that have the potential to cause significant, perhaps permanent injuries, then we can use that information to make better decisions about how best to accomplish a particular mission.

I would like to hear from the witnesses what Congress can do to ensure the Department of Defense has the resources it needs to conduct its planned work and where we can help. Only this is about the well-being of the individuals that are willing to put on the uniform, who are closest to the front line of combat, and every servicemember that is diagnosed with TBI.

We owe it to them to ensure -- and their families to ensure that when they go into harm's way, they are well-trained, have the right protective equipment, and are utilized in a manner that achieves the objective with an understanding of the risk involved.

I want to thank you to all the witnesses for being here today. I look forward to your testimony. And again, I want to thank Senator Warren for putting this together.

Senator Warren: Thank you.

[Technical problems.]

STATEMENT OF SAMANTHA MCBIRNEY, PROFESSOR OF POLICY ANALYSIS, PARDEE RAND GRADUATE SCHOOL

Dr. McBirney: Chairwoman Warren, Ranking Member Scott, and members of the committee, good afternoon, and thank you for the opportunity to testify today. My name is Dr. Samantha McBirney, and I am a Biomedical Engineer at the nonprofit, nonpartisan RAND Corporation.

My research for the last 15 years, not only at RAND, but also at the University of California, Berkeley and the University of Southern California, has focused on traumatic brain injury, or TBI, both as the result of blunt impact and blast overpressure.

Today, I would like to speak with you about repeated exposure to low level military occupational blasts, which are low level blast exposures experienced while fulfilling military occupational duties.

Evidence suggests that servicemembers are exposed to these blasts in the form of blast overpressure, or the pressure wave that emanates from the source of an explosion. This pressure wave can cause sub-concussive injuries which are not immediately detectable and would not qualify as a TBI.

Exposure to blast overpressure can occur both in combat and in training, as has already been mentioned. During training, exposure can be due to breaching exercises

and the firing of increasingly powerful weapon systems, such as the Carl Gustaf recoilless rifle and the AT4.

To provide some perspective on the level of exposure some servicemembers have, one study found that up to 32 percent of blasts experienced by breaching instructors exceeded the recommended exposure limit.

Studies have shown that the cumulative effect of repeated low level blast exposure can cause symptoms similar to TBI. While a variety of effects have been linked to low level blast exposure, as Senator Warren and Senator Scott have already mentioned, there remains a lack of scientific evidence linking repeated exposure to injury. One reason for this is the difficulty of diagnosis.

The very nature of low level blast exposure, and the fact that it is not one single event that causes an issue, but rather the cumulative effect of repeated exposure over time complicates injury recognition.

Symptoms typically do not manifest immediately, which makes it unlikely that repeated exposure to low level blast is identified as the cause. Additionally, injury is vastly underreported among servicemembers, only obfuscating the issue of proper diagnosis further.

There is also a lack of research about the military occupational specialties at greatest risk of exposure to low level blast. While there is no doubt that certain

occupational specialties are more frequently exposed than others, there is little research to support these hypotheses.

So, there remains a lack of understanding of the direct impact that repeated exposure to low level blast has on the health of servicemembers in different occupational specialties. If the preventive intervention is perfectly effective but cannot be delivered in time, it is not useful.

This quote from a 2019 RAND report perfectly describes the current state and the reason many of us are here today, "as a research community, we clearly see that additional research needs to be done. However, there are steps the DOD can take now to better protect servicemembers against blast induced injury."

I highlight four recommendations in my written testimony, and I would like to bring your attention to one of them here, the creation and maintenance of blast exposure records. These records should include number of exposures, the context of each exposure, and any physical, mental, or emotional effects resulting from that exposure.

This would allow the DOD to better track exposure frequency, assess the occurrence among high risk occupational specialties, determine the connection between exposure and health outcomes, and develop strategies to

mitigate exposure in training environments.

Ultimately, these records could be used to develop an index score to gauge an individual's combat readiness and potential health risks. As our weapon systems continue to become more advanced and increasingly powerful, low level military occupational blasts will remain an enduring challenge for servicemembers.

Addressing the issue of repeated exposure to these blasts necessitates action and collaboration between the DOD and the research community. By implementing the recommendations as outlined in my written testimony, alongside continued research efforts to close substantial knowledge gaps, the DOD can take significant strides towards better protecting the health and well-being of our servicemembers.

Thank you, and I look forward to your questions.

[The prepared statement of Dr. McBirney follows:]

Senator Warren: Thank you.

STATEMENT OF ROSS D. ZAFONTE, CHIEF OF TRAUMATIC BRAIN INJURY AND HEALTH & WELLNESS PROGRAMS, HOME BASE

[Technical problems.]

Dr. Zafonte: Good afternoon, Chairwoman Warren, Ranking Member Scott, members of the subcommittee. My name is Dr. Ross Zafonte. I am honored to provide testimony today on traumatic brain injury care and blast exposure. My career is centered around improving the lives of people with traumatic brain injury.

I currently serve as President of Spalding, Chair of the Physical Medicine Rehabilitation Department at Harvard Medical School, Chief of the Department of Physical Medicine Rehabilitation at Mass General Hospital and Brigham and Women's Hospital, and for the past 15 years, I have served at the Home Base Program, directing its Brain Injury Program. I actually see the patients, as well as do the research.

Blast overpressure, as we just heard, is a sudden onset of a pressure wave from explosions occurring with shoulder carried artillery in training or deployment, in breaching buildings, and from improvised explosive devices. Generally, the bigger the explosion, the more damaging the pressure width.

TBI can have a wide range of physical and physiologic effects. Some signs appear immediately, others take days

or weeks to occur, and they may result in physical, sensory, cognitive, behavioral, or mental impacts.

According to the Department of Defense, since 2000, over 400,000 U.S. servicemembers experienced at least one brain injury and 40 percent of those later screened positive for co-morbid psychological health conditions.

Our own research has noted an elevated ten year risk of hypertension, cardiac disease, endocrine or hormonal dysfunction, and behavioral concerns such as depression even among the youngest of patients.

Home Base is located in Charlestown, Massachusetts, with, I am proud to say, as a native Floridian, satellite locations in Florida and Arizona, and operates one of the oldest and most impactful private sector programs in the nation.

For 15 years, we have served as an incubator for innovative clinical care models and research, and the program is nested within Mass General Hospital, allowing us to leverage the faculty in Mass General Brigham Health System. Home Base bridges the gap between research and clinical care.

Now, in 2018, Home Base was approached by the Navy Special Warfare with a complex set of problems facing Navy SEALs. We quickly developed a comprehensive brain injury and polytrauma program. This program is named COMBAT, or

the Comprehensive Brain Health and Treatment Program.

It is modeled after existing programs that we developed for elite athletes and provides integrated, multi-disciplinary, specialist treatments, evaluation and care coordination for veteran and active duty operators. Home Base has treated nearly 1,000 special operators through our intensive programs.

71.9 percent of combat participants are active duty and the overwhelming majority return to duty, so we are keeping the fighting force active. We currently have 178 active duty special operators waiting to be screened and scheduled for COMBAT Program, and COMBAT has cared for operators in 47 States, the District of Columbia, Guam, Puerto Rico, including 53 patients from Massachusetts, 60 from Florida, 6 from Connecticut, 22 from Hawaii, 278 from Virginia, 4 from Illinois, 1 from Alaska, and 54 from North Carolina.

The COMBAT program is highly efficient, agile, and compressed into a five day model of care. Patients see a minimum of nine providers, and this may expand grossly related to pertinent diagnostic imaging or other studies.

So, in summary, we are very grateful for the support of Congress, especially Chairwoman Warren, has shown this program, and for the partnership and financial support provided by SOCOM.

The program is successful and the demand for care is growing at a steady pace. Based on my experience in this field and treating patients at Home Base, I would recommend the Department of Defense consider the following options. Invest in and develop tools to measure --

[Technical problems.]

Dr. Zafonte: Increase funding for partnerships with academic medical centers. Ensure all servicemembers with traumatic brain injury can easily access care. And as has been said, that data needs to be linked to blast exposure.

Develop novel methods to define and understand the impacts of declining health spans and develop treatment interventions. I also recommend that DOD partner with Home Base to develop a long term, longitudinal health span study on the multi-system injury of blast and traumatic brain injury.

And invest in research that evaluates and treats the long term sequalae of repeated brain injuries of blast exposure. Thank you for the opportunity to testify on this very important topic, and for your commitment to supporting members of the military. I am happy to answer questions the committee may have.

[The prepared statement of Dr. Zafonte follows:]

Senator Warren: Thank you, Dr. Zafonte. Mr. Larkin, would you like to make an opening statement?

STATEMENT OF FRANK J. LARKIN, CHIEF OPERATING OFFICER, TROOPS FIRST FOUNDATION, LEAD OF NATIONAL WARRIOR CALL DAY INITIATIVE

Mr. Larkin: Thank you to the committee for the opportunity to speak. My formal testimony is submitted for the record.

As a former Navy SEAL, I am here today to be a voice for all those that have worn our nation's uniform and are currently struggling everyday with both visible and invisible wounds. Wounds that transcend mental, physical, and spiritual domains. Wounds that transcend -- I am sorry, wounds that have influenced an epidemic level of suicides amongst our active-duty force and veteran populations.

My intent today is not to pounce on the Department of Defense or the Veterans Administration, but to help them succeed. I would not be here if it was not for my son Ryan, U.S. Navy SEAL Special Operator 1st Class Ryan F. Larkin. My son would be 36 years old today if he had not taken his life on the morning of April 23rd, 2017.

He had been suffering from what we have come to characterize as invisible wounds, a complex rubric of post-traumatic stress disorder, moral injury, and substance use disorder that was complicated by undiagnosed traumatic brain injury from blast exposure, the signature injury of

the past 20 plus years fighting the global War on Terror.

Ryan was a highly decorated and accomplished Navy SEAL, trained as a special operations medic, sniper, and explosives breacher. He loved being a SEAL, furthered by the love and loyalty for his teammates that was cemented on the battlefield.

Following four heavy combat tours in Iraq and Afghanistan, Ryan, like many others who have worn the uniform of our nation in combat, began experiencing uncharacteristic changes that manifested in difficulty sleeping, nightmares, anxiety, hypervigilance, loss of memory and declining cognitive functions. He stopped smiling. He sought help, but the help that was offered was not aligned with what he needed.

When his condition became more complicated, and their proposed solutions didn't work, the system weaponized his pleas for help against him and pushed him out of the SEAL team and out of the Navy.

This abrupt separation created another deep weeping wound. He felt that he had let his teammates down, abandoning them. The system he trusted hung labels on him to justify their assessments and their actions. A year after he honorably separated from the Navy, Ryan ended his life. Ryan repeatedly said, something is wrong with my head, nobody is listening, they keep telling me I'm crazy.

This was reinforced by the endless stream of medications prescribed by both defense health and VA clinicians to address his behavioral symptoms, not the root cause of his challenges. Everything defaulted to psychiatric and mental health illness, with very little mention of TBI, despite his operational profile and repeated exposures to blast overpressures from our weapons systems and enemy IEDs.

Over the course of two years between defense health and the VA, he was prescribed over 40 different medications, everything from potions, lotions, and creams to high end psychotropic and mood stabilizing drugs. He never received a clinical diagnosis. He was a walking experiment.

One night prior to his death, he said that he wasn't going to live very long, that he was broken up inside. He made me promise that if anything ever happened to him, that he wanted his body donated for TBI-Breacher's Syndrome research. Then he turned to me and said, you know dad, it is going to take guys killing themselves before the system wakes up to the fact that it has a problem.

The guys are hurt. Ryan's brain was donated to a DOD research effort at Walter Reed National Military Medical Center. Two months later, we learned that Ryan had a severe case of undiagnosed microscopic brain injury

uniquely related to repeated blast exposure. Ryan was hurt, not crazy.

He was right all along. Unfortunately, our medical enterprises could not and still cannot see this level of microscopic injury in a living warfighter or veteran. My son died from his injuries suffered both in training for combat and combat operations.

He just didn't die right away. These warriors with invisible wounds, they are hurt. They are not broken. They break when they are cut away from their teammates, their tribes, and are betrayed by the institutions where they have given their all. It has been 23 years since 9/11. DOD has spent almost $3 billion in mental -- on mental health, substance abuse, suicide prevention, PTSD, TBI, and other warfighter assistance programs.

I give them a D plus, C minus at best, for the lack of measurable impact for those who need answers. Those are the deck plate, dirt level warfighters we promised to take care of and not leave behind.

Blast exposure is a key threat to warrior brain health and potentially represents a significant national security threat to our force, readiness, and resiliency. However, whatever solutions we come up with, it can't impact our operational effectiveness or lethality on the battlefield.

We need to do this smarter and by down the risk on the

front end. Thank you for the opportunity to be the voice for others like Ryan. Subject to your questions.

[The prepared statement of Mr. Larkin follows:]

Senator Warren: Thank you, Mr. Larkin. I appreciate your being here and sharing this story. I am sorry for your loss, and I am sorry for the treatment your son Ryan received. I think you said it right, traumatic brain injuries are considered "the signature wound" of our wars in Iraq and Afghanistan.

While improvised explosive devices, IEDs, may have caused some of these medical injuries, a military medical research study found that for troops with mild traumatic brain injury, "the most important cause of brain injury was the long term exposure to explosive weapons."

In 2011, the Defense Advanced Research Projects Agency determined that 75 percent of the troops' blast exposure in Afghanistan was coming from their own weapons. The effects of blast overpressure are terrible, including memory loss, increased risk of dementia, and substance abuse problems.

But despite the severity of these impacts on servicemembers' health, when these problems are diagnosed, blast exposure is rarely identified as a potential cause. Dr. McBirney, you have studied this issue for 15 years now. Why is it so difficult to detect when blast overpressure is causing the types of symptoms that we are talking about here in our servicemembers?

Dr. McBirney: That is a great question, Senator Warren, and a question that so many people within the

research community are committed to answering. It really comes back to the nature of the injury itself.

We are not looking at an injury that is caused by one isolated event. The fact that it is caused by repeated exposure to very low level blasts that perhaps might happen throughout the course of an entire military career really complicates injury recognition.

Add to that the fact that symptoms typically don't manifest immediately, as was mentioned, and it becomes increasingly difficult to link symptoms to repeated exposure.

Senator Warren: So, yes, I just want to say, I want to pick up on this, because I think this is a really important point about the challenge in trying to diagnose because of the very nature of what the injury looks like. It is not a single moment in time where this happens. And so, I just want to pick up and let's see if we can take this forward.

We need to know how often, I take it from your testimony -- we need to know how often a servicemember has been exposed to blast overpressure, to give medical personnel the information that they need to identify and treat the underlying cause of their symptoms. Now, so far, the DOD only has blast exposure data for a total of 500 servicemembers.

We are missing data, obviously, for a whole lot more. Tracking this information through blast exposure and traumatic brain injury logs for all servicemembers would be a good start, but we also need to pay special attention to servicemembers that are at especially high risk for blast exposure.

Some military occupational specialties, MOSs, such as training instructors, are significantly more likely to be exposed to blast during training or operations. The Marine Corps found that the artillery community is also at particularly high risk and that high rates of exposure could lead them, "to suffering injuries faster than combat replacements can be trained to replace them."

So, Dr. McBirney, I wanted to give you another chance in this is we are trying to push this forward, does DOD currently have the strategies it needs to mitigate the risks from blast overpressure that are specific to each of the military occupational specialties that are most likely to be exposed?

Dr. McBirney: I can't say I am aware of any of those strategies. And in addition to that, a lot of the folks with whom I interact on a very regular basis with boots on the ground in these communities that are at risk of significant exposure are additionally unaware of such strategies.

Senator Warren: Okay. So, anything more do you want to say about what DOD should be doing in this space? I want to make sure I have given you a chance here.

Dr. McBirney: No. Thank you, Senator. I think really Mr. Larkin and I were discussing prior to this. I think if my -- if I could choose the key takeaway for today, it would be to not let perfection interfere with progress. I think everyone here is looking for the right solution. And what we really want to be sure of is that we don't wait too long to implement what we think is a perfect solution.

There is a lot of research that still needs to be done. Coming from the research community, I am always a supporter of more research. That being said, we can also be looking to implement solutions, study said solutions, while they are being implemented at the same time.

Senator Warren: So, let's focus on that for just a second, just a little bit more, about the idea of collecting the data as we go along, so at least it is a first step in getting the information that we need.

I understand this is a gap that DOD needs to fill, and I understand that it is more challenging to limit servicemember blast exposure during combat, but there is no excuse for DOD to continue to expose servicemembers to unnecessary levels of blast overpressure during training.

This is obviously an area where we could make change, and it is clear that there is a lot we need to do to protect our servicemembers from blast exposure.

But DOD, it goes to your point Dr. McBirney, DOD constantly says we need more research, we need more research. And I am a data nerd. I always want more research, but I am very concerned about the idea that we are going to put off treatment.

So, let me put the question more specifically to you, and that is, do you think we know enough now about the risks of blast overpressure to servicemembers' health to start taking action now?

Dr. McBirney: In short, absolutely. Yes.

Senator Warren: All right. So, we do know enough. So, there are number of steps DOD could take to help us get more data so that we can understand this over time, but more importantly, a number of steps they could take right now in terms of treatment.

And I have talked long enough so I will come back to you later on this, Dr. Zafonte and Mr. Larkin. Senator Scott.

Senator Scott: Yes. Well, first, Mr. Larkin, I can't imagine -- having kids and grandkids, I can't imagine lose one. So, thank you for your service, your son service and just hope as a result, you know, something good happens out

of it. Somebody -- it prevents something else from happening.

Dr. Zafonte, can you explain what the -- the blast, what does it do to the brain like this? Like let's say, you know, I go shoot a shotgun or doing this stuff, what does it do -- each one of them, how does it impact my brain?

Dr. Zafonte: Well, I think, to my colleagues' good point, perfection is the enemy of the good. And you can criticize all of the models, but we know that these sub-concussive injuries do a number of different things.

They probably disproportionately impact areas of the brain at gray matter, white matter interfaces. They probably have a vascular effect. More likely long term, there is possibly a premature aging effect to the brain itself with multiple repetitive blast exposures or certainly with traumatic brain injury.

So, lifelong exposure, getting that quantification that Senator Warren talked about is critically important because we need to know one thing. We need to know in who, how much, what were they doing, and then what was the actual phenotype or what actually happened to the symptoms of the person, and track that very carefully.

Senator Scott: So, right now, you can get a glucose monitor and put all your data in there, and pretty fast you

can get a correlation, right? So have you had any opportunity to take -- because we know, if you joined the service, we know what blast you are going to have in boot camp if you are enlisting -- you know, enlisted. And so, is there anybody that is doing anything to just say that when you just put all this data on something and then just look at the model over a period of time?

Dr. Zafonte: I think there are a number of groups, including our own, looking at blood based biomarkers for people, neuroimaging. And all of those are critical as we understand the exposure and the diagnosis.

But we also want to know how those things and specific lifelong exposures impact the symptoms of the person. Because there is not a 1 to 1 relationship. There's a relative relationship.

Senator Scott: So, if you had -- if every service member, if you had the data of -- you know, just start today. Just anybody new that joins boot camp and starts going through infantry training. And you know, if you just have the data and you had that in front of you, then over time you could do predictive analysis of, you know, where the problems are, right?

Dr. Zafonte: Right. And I think that -- but to the point that was just raised, I think there are action steps now and that we have -- we are compelled very much so to

make this a living learning environment and continue to collect data and perhaps change policy, change programs, change how we treat people as we understand more over time.

Senator Scott: So, you don't have enough information today exactly what happens as all these blasts happen. What you have is, you know, you see the result. You see over a period of time that this is what happens. That is what you have so far, right?

Dr. Zafonte: I think that is right. I think, Senator, what we have, and thank you for the excellent question, is a series of smaller studies that show changes in your imaging, changes in blood based biomarkers, representative of injury of the brain. But how it is going to behave in a large population of people is one thing. How it is going to behave in Bobby or Sue is a very different thing.

Senator Scott: Right. Okay. And how -- so, Dr. McBirney, how hard it would be to just put up a program? It wouldn't be that hard, would it?

Dr. McBirney: That is a great question. Unfortunately, one that I find myself unqualified to answer.

Senator Scott: But we do it in a whole bunch of other stuff. We do it like with glucose monitors, right. And if you gave servicemembers just -- you know, just say, here

-- they all have cell phones, right? You just had an app that said, okay, so every time you have exposure okay, you put this in. You put in exactly what you did and what you shot.

And some people are not going to do it well, just like no one follows their health -- you know, they didn't take their medicine. But that wouldn't be that hard to do, right? I mean, we have all this stuff from sugar levels.

Why don't we do -- I mean, why don't we -- why wouldn't that be the simplest thing to start doing and then you could start seeing that, like -- if you could -- if you had all that data, you could pretty quickly do a predictive analysis of even short term problems. Not, you know, it take a long time to say what is my 20 year problem, right.

Dr. Zafonte: Yes, I think following people over decade will be valuable. I think we will see certain markers and certain things change early on, but we have to remember that it is not an uncomplicated story.

Even the blood based biomarkers or other entities such as imaging have a lot of variation within. You know, the brain, I think my colleagues would support me, is an incredible structure, but it is also a bit of a black box still within science, and understanding how different networks relationships, how these nodes connect, and an injury in one space affects an injury another, that is a

challenge.

Senator Scott: But you would actually know the result. I mean, you even though you don't know exactly why, you could over time predict what is going to happen.

Dr. Zafonte: If you are looking for symptomatic, senator, prediction I think with a large enough data set, you certainly could draw some strong relationships.

Senator Scott: Right. And then very quickly come back and say, okay, we know this. We know that if you have this much, you know -- the, you know, the odds are like you can go get a blood test for cancer now and it is very predictive of whether you are going to end up with cancer. Is it perfect? No. I mean it depends on the cancer. So, it seems like this would be pretty easy to do and it shouldn't be that hard.

Dr. Zafonte: So, Senator, I would agree with you, but I would bring up the issue that we are all individual and different people, and these types of injuries affect individuals in a different way.

So, a series of years' worth of exposure is affected by who you were beforehand, the kinds of exposures, and then the treatment you had afterwards. And that produces this result, and the fact that it is not so easy to put in a box.

Senator Scott: Right. Okay. Senator Hirono.

[Technical problems.]

Senator Hirono: I call myself for five minutes -- [technical problems]. There are a lot of our servicemembers who were exposed to IEDs during the tenure in Afghanistan and Iraq. So, are you tracking these servicemembers? Most of them probably are in veteran status. Are you tracking them for exposure to blasts and what is happening to them? Anybody?

Mr. Larkin: So, I used to be a senior leader within the Department of Defense running the Joint IED Field Organization, JIEDO. And I can tell you that it was a concern as far back as 2008, 2009, that these blast exposures were creating a unique health risk to our warriors.

We had gotten to the point where we had up armored and created new armored vehicles that were surviving the blast, but what got in that vehicle and what came out of that vehicle were two different states, and it alerted us to the fact that there were things -- that blast effect was having an effect on the human body that needed to be studied and researched.

So, as far as you know, having a handle on -- unless there was a catastrophic injury and usually one that was visible, at the time, if they -- a lot of these folks came out of these vehicles, and they looked fairly normal.

Senator Hirono: Yes.

Mr. Larkin: And it wasn't until time evolved that we started to see the behavioral changes, cognitive dysfunction, and so forth. I have no knowledge of whether anybody attempted to formally collect on that data and do anything with it.

Senator Hirono: I think that is an important kind of follow up as we try to understand what the impact of these blasts are long term. Also, I would think that -- I mean, it is bad enough that there is traumatic brain injury that needs to be followed up on, but I would think that a lot of them may develop conditions such as ringing in the ears. Yes, so, Dr. Zafonte.

Mr. Larkin: Thank you very much, Senator, for the excellent point. I think we have long term sequelae for people such as tinnitus or ringing in the ear, chronic headaches.

Senator Hirono: Yes.

Dr. Zafonte: Pain is a big driver that drives not only a headache or one's immediate perception, but it also invades behavior. People who are in pain don't behave the same way, and they don't cognitively perform the same way.

So, what I am saying is that blast has a multi-system effect. Of course, the brain is our principal and driving concern, but it has effects in things that are linked to

the brain, linked to the behavior that we need to know more about.

Senator Hirono: Well, for example, tinnitus -- that doesn't cause pain, but it is severely annoying. It can be debilitating. And I don't know whether you are -- it sounds as though you are also tracking the incidence of these kinds of issues, and it is something I am very familiar with, and there seems to be no cure for these conditions.

And so, I am very interested to know what kind of breakthroughs there are in treatment -- I know that tinnitus is the disease, and tinnitus is a ringing that's not related to any problem with the ears. So, is that something that you all are also studying, tracking?

Mr. Larkin: Senator, all I can tell you is that I have it from the use of explosives and weapons.

Senator Hirono: You have it?

Mr. Larkin: It doesn't go away.

Senator Hirono: I know.

Mr. Larkin: It is just -- I have to live with it.

Senator Hirono: Me too. It is very annoying. And sometimes it is so loud that it interferes with sleeping. So that is -- I think that there are a lot more of our servicemembers who have endured or are enduring those conditions that we have to pay attention to. One more

question.

A 2023 RAND report noted that there is a critical gap in effective PPE in that most models represent the average human male. So is that -- and this is for Dr. McBirney. It is certainly important that we protect -- provide protective equipment to all of our servicemembers.

So how can we make sure that this kind of protective equipment is also -- is appropriate for women. Is that happening?

Dr. McBirney: And that is a great question, a very important topic, and it is happening. So those findings were from the last state of the science meeting that we had on blast induced injury, and we were happy to learn that there is quite a bit of research being done in the community to make sure that the average male, and specifically in many instances the average Caucasian male, is not the only subject that is being used to test equipment.

Senator Hirono: Yes. That is very important. Thank you. Thank you, Madam Chair.

Senator Warren: Thank you. Senator Ernst.

Senator Ernst: Thank you very much, and good afternoon. And I would like to thank you, Chairwoman, for the invitation to participate in this subcommittee today. It is a very important discussion that we are having about

the impact on our servicemembers and their families.

And traumatic brain injuries can arise not only from the combat deployments, but also from those routine training exercises that our men and women go through every single day. Even when they are adhering to safety standards and established safety guidelines, the act of firing heavy weapons, just as you stated, Mr. Larkin, can create those long term effects.

Other types of training sessions in preparation for combat deployments, many of these things can potentially lead to cognitive impairments affecting our function. And, Mr. Larkin, I understand that you shared the story about your son, Ryan.

And I want to thank you so much for your service as a Navy SEAL and your son's service as a Navy SEAL. It was through Mr. Larkin, through Frank sharing his son's story with me many years ago that I finally understood the need to be involved with traumatic brain injuries.

So, thank you so much for sharing what is a very difficult story to tell, but one that is incredibly important for every young man and woman that puts on the uniform of our nation. So, thank you for that. And Mr. Larkin, did you share with the subcommittee then how it was discovered that your son Ryan had traumatic brain injury?

Mr. Larkin: Thank you for the question, Senator, and

thank you for your comments. Ryan had expressed his desire that if anything ever happened to him, he wanted his body and his brain donated for traumatic brain injury breacher syndrome research.

That subsequently was done, and his brain was donated to an activity at Bethesda, Walter Reed that postmortem analysis revealed that he had an undiagnosed microscopic level of brain injury that was uniquely aligned with blast exposure. They only see this pattern of injury with blast exposure.

And if we had not gotten that finding, the narrative that the Navy had built around Ryan and his struggle, and his subsequent passing would have continued on -- would continue to have damaged his reputation. But this finding was indisputable that he was injured. He was not, in his terms, crazy.

Senator Ernst: Exactly, Mr. Larkin. And I just want everyone to understand that so many of these injuries go undetected through CAT scans, through MRI's, PET scans.

And as a follow up to that then, and I am very grateful that Ryan had chosen to do that because you would not have known about those injuries otherwise, but then for you, and Dr. Zafonte -- is that right?

I want to make sure I get it correct, Dr. Zafonte, is the automated neuropsychological assessment metrics, the

ANAM test that is used by the DOD, an accurate method of detecting those changes in cognition that can lead to a TBI diagnosis?

Dr. Zafonte: Senator, thank you for the excellent question. I think we are searching for a gold standard. A number of these measures, including the ANAM, have significant flaws in them.

Everything from the way they are administered, to challenges on their consistency and internal behavior within an individual and external to other individuals. So, while it is an interesting screening tool, it is far from perfect.

Senator Ernst: Yes. And that is why I hope we continue to work towards alternatives or ways that we find that gold standard. That is something that this subcommittee is working on. You have spoken a little bit about wearable devices as well that might be able to diagnose a TBI or blast exposure.

All of these things require research, development, recommendations. Are you confident that we can get to a point where you are able to make recommendations to Congress, to DOD, that will provide us a path forward in protecting these men and women. Any thoughts -- yes, Dr. Zafonte.

Dr. Zafonte: Thank you, Senator, for your excellent

question. I would say, and I think my good colleague said this before, perfection is the enemy of the good. There are things we know to do now, and as we learn more, we should do better.

And I think if we act and think our responsibilities to make this a dynamic, learning, positive environment for our servicemembers, we can do things now while evaluating data and really making positive change in the future.

I think we are going to learn that there is a lot more of that microscopic injury than we had ever believed, and then in certain people, that is going to have some significant sequelae over time.

Senator Ernst: Thank you, Dr. Zafonte. And I believe you are absolutely correct. I think there are a lot more servicemembers out there that have sustained various micro tears or injuries to their brain. And I was reminded of this quote not too long ago. And it's an old one, so forgive me, but if the human brain were so simple, we could understand it, we would be so simple we couldn't.

And just let that sink in, because I think we are always going to be striving to find the answer that we need when it comes to traumatic brain injury. We may never reach that 100 percent solution just because of the dynamics of this incredible organ, but it doesn't mean we should just let it go. There are absolute, disruptions to

families, just as we have heard from Mr. Larkin.

And it is incredibly important that we pursue not only ways to prevent traumatic brain injury, but that we also find ways if it does occur and we won't be able to prevent it in 100 percent of cases, but if it is to occur, we need to find ways to treat it and mitigate the impact to our families.

So, thank you again, Chairwoman. I really appreciate the opportunity to be here today.

Senator Warren: So, I just want to say a very special thank you to you. Senator Ernst, Senator Ernst is not on this subcommittee.

And, like many in the Senate, she has an absolutely packed schedule, but she has been engaged for years now on the issues around traumatic brain injury and working toward changes in the law, both for the documentation that will lead us to better diagnoses and also for the resources to begin treatment now for those who need it.

And she wanted to be here with us today. And I appreciate your coming and doing this. Thank you. Thank you, Senator Kaine.

Senator Kaine: Thank you, Chair Warren, and to the subcommittee for having this hearing. It is really important. And I am just going to ask the same question of both panels. So, I just have one question and I would love

to get your take, and I will ask the same question to the second panel.

We are not the only country that employs weapons that can have these effects on servicemembers' brain health. So, what have we learned or what can we learn from the experience of other nations and their militaries, either about strategies to prevent or strategies to treat?

Mr. Larkin: Senator, again, in my role as a senior leader of the Joint IED Defeat Organization at DOD, back during the height of Iraq and Afghanistan, this was not a U.S. only problem.

You know, we were very much in the trenches with our NATO allies, Five Eyes partners, who were all experiencing the same challenges with maneuvering on the battlefield because the IED had paralyzed our movement and the IED was the weapon system the enemy used against us that literally brought home all the casualties and fatalities of those two conflicts and Africa.

And, you know, if we don't bridge communications with those countries as we try to solve this problem, we are missing a big part of it. They have a great data. They are as concerned about what we are talking about as we are.

I think that really we need unsolicited -- we need a gyro like task force to bring together the Government, industry, academia, and our foreign partners for a unity of

effort to match the data, the intellectual capability, and our technology to solve this.

We can solve it. It is just that we have different ad hoc efforts going on right now. They are not coordinated. We are handicapped by a lack of data sharing. And like I said, we got to get everybody on -- in the same --

Senator Kaine: And even within our own family. I know this panel too has DOD, but not VA. I mean, I am I know in the Richmond, VA, this is a very high priority. So, sharing within our family certainly, but with our allies who have the same experience is really important. Dr. McBirney or Dr. Zafonte, do you want to add to that at all?

Dr. McBirney: Sure. No, thank you for the question, Senator, and it is an excellent one. One consideration that I know some of our allies are considering at this time, and it was published in a report in 2018 by the Center for a New American Security, is reviewing and updating firing limits for a lot of these weapon systems.

Those firing limits haven't necessarily been revisited in some time. And so, in my written testimony, there is a direct quotation from that CNS report in 2018 that details exactly what information to revisit in these weapon systems manuals, and perhaps consider updating to really get at mitigating exposure that our servicemembers experience in

training in particular.

Senator Kaine: Dr. Zafonte.

Dr. Zafonte: Senator, thank you for the great question, and I agree with the comments of my esteemed colleagues. I would add just one other thing, you are completely right. There is power in numbers. There is power in togetherness. There is power in the opportunity to discover and serve our allies throughout the world.

And so, I would advocate for common data elements, common data sets that go across our allies as we think about these kinds of exposures and the kind of long term sequelae, both immediate, what does somebody feel now, and then what do they experience years later. Those kinds of things would be incredibly important and doable in many other health systems.

Senator Kaine: Thank you very much. I yield back.

Senator Warren: Thank you. Very important. Senator Sullivan.

Senator Sullivan: Thank you, Madam Chair. And thank you and Senator Scott for holding this hearing. I think it is a really important one, and I want to thank the witnesses for their attention to these really important issues for our military.

So, I got here a little bit late, so if this has already been discussed, bear with me, but I want to dig

into this New York Times article from November of 2023 entitled, A Secret Strange -- Secret War, Strange New Wounds, and Silence from the Pentagon. And this was about the Marines in Syria deployed in Syria in 2016 and 2017.

And, they returned and really struggled with PTSD issues and health issues, and it wasn't from direct combat. I mean, they were in combat, but it was primarily from there, it appears, really significant amount of firing howitzer rounds.

And kind of to Senator Kaine's point, we have had military members in different wars, Vietnam, Korea, WWII, of course, fire thousands and thousands of howitzer rounds. But so, we have seen this before, but these Marines seem to really have struggled. Have you -- either of you read this report or this story? Okay.

And then, Senators Warren, and Ernst, and Tillis on January 18th, letter to Secretary Austin asked him a lot of specific questions relating to this and other issues that relate to TBI. But this is a kind of a different TBI.

So, sometimes I worry, you know, I just retired from the Marine Corps myself, and I love the Marine Corps. But, you know, like all big organizations, they can be bureaucratic, and I am not sure these Marines are treated very well. And I am wondering, from your experience, maybe we will start with you, Dr. Zafonte, what is your

assessment of that report? Was well done reporting, in my view, from the New York Times.

And what do you think the next steps should be? Obviously, we will ask the Government witnesses in the next panel on this topic but would just like to get your assessment from this particular episode. A lot of my constituents in Alaska wrote -- read this article and were quite disturbed by it.

We don't even have a big Marine Corps presence in my State, but big Army and Air Force presence. So, can -- I would like all of you to just comment on what your thoughts were and then what we can do - you know, if the Marines haven't seen this, you can see how they could overlook it, but we -- I think this needs a much deeper dive than the military has given it.

And to the chairman's credit and some other senators are already pressing Secretary Austin on it. So, what are your thoughts on it?

Dr. Zafonte: Senator, thank you for the excellent point and question. From my perspective, I think that the piece brought up a series of issues. It really took the cover off of some things and made them more public in some ways.

And it talked about many of the long term sequelae, near term and long term, that are being seen clinically in

this population of people. Now, these are extreme individuals, many of them. They are the 1 percent of the 1 percent. They are the fittest, the swiftest, and yet they are seeing clinically apparent problems. There are also, in many ways, the most resilient. They are selected many times.

So that raises for me some real concerns. It may be related to the density of the exposure. It may be related to the lifelong exposure. And it may be related to a global elements of the life in that kind of stress for a significant period of time.

So, I think we need to learn a lot more about the long term issues here and the short term ones. And I think part of the way we do that is better quantifying the exposure and the person over time.

Senator Sullivan: Great. Doctor McBirney, do you have a view on this?

Dr. McBirney: Absolutely. No, and thank you for raising this. I thought that New York Times article was very well written and well investigated and reported. I think --

Senator Sullivan: And by the way, just for the record, I don't believe everything at the New York Times writes.

[Laughter.]

Dr. McBirney: Certainly.

Senator Sullivan: And so, Senator Warren might -- no, I am just kidding. But so, I am sure the Marines had some points in there that probably weren't reported, or I am not saying it was a perfect piece, but it raised an important issue. And these young men, to Dr. Zafonte's point, these are, my view, the best of what we have in America. And we certainly, you know, we need to take care of them.

Dr. McBirney: Absolutely, agreed. I think the one of the main takeaways for me when I read that article was the fact that there is a culture that is pervasive across the DOD, unfortunately, that really contributes to this underreporting that we see of injuries. And I think the way that these men were treated is indicative of this culture and the fear that a lot of servicemembers have when it comes to reporting injuries.

There have been many studies done on the underreporting of traumatic brain injury. There are a variety of reasons that servicemembers don't report injuries. But fear of negative repercussions on their military career is certainly a huge one. So, I think when I read that New York Times article in the series of articles, that is really what came to my mind, is a culture that needs changing if we hope to improve this.

Senator Sullivan: Yes. And, Mr. Larkin, real quick.

Sorry, Madam Chair. You know, there -- and I don't know if you have a view on this, but we have had many wars with many thousands and thousands of artillery rounds fired. I had an 81 millimeter mortar platoon for two years on active duty, my Marines.

We fired, you know, all kinds of 81 millimeter mortar. That is not as big as these howitzers, but it is a big mortar, and, you know, you feel it when you are firing those, and your ears hurt when you don't have your ear protection on because it is so loud.

But what is your sense on how we need to look at this, that article, but compare it to other wars where we have shot thousands and thousands and thousands of rounds.

Mr. Larkin: So, you know, if I am going to put my money, it is going to be on the preventative end as much as we can to by down these injuries. But I completely agree with Dr. McBirney, the issue here is about trust.

You know, you are not going to get in reporting unless there is trust that is built between that operator or that warrior and the system. We have collected blast data on -- in a variety of different efforts --

Senator Sullivan: On artillery too?

Mr. Larkin: Just in, you know, a variety of different settings where blast gauges and so forth have been worn by our warriors. We have no idea where that data has gone.

So again, it never comes back to the warfighter like a dosimeter would for radiation.

So, they say, well, you know, we wear these things, but we don't hear anything back. One of the things, and it might be a novel idea I offer, is, you know, when we procure and acquire weapons systems and munitions, why don't we ask those manufacturers to provide us with blast overpressure data according to strict criteria that they all have to follow, that ultimately will allow us to craft training protocols and potentially surveillance programs for the more high risk occupation.

But again, we have been calling this by a different name coming off the battlefield since WWI, and it all has rested in psychiatric mental health diagnosis, and we are now starting to realize this is a biological injury caused by blast overpressure.

Senator Sullivan: Thank you. Thank you, Madam Chair.

Senator Warren: Thank you. I have another round of questions that I want to do. I know Senator Scott does. If anyone else does, we are glad to do it. But I want to pick up on what Mr. Larkin was just talking about, and that is trust. That servicemembers who have been affected by blast overpressure aren't getting the help they need.

And the question is, why not? And I will go back to The New York Times article because it does give us some on

the ground anecdotes that people are experiencing. So, a Marine Corps officer who is leading an artillery unit was quoted in this story saying that he was experiencing severe headaches and small seizures but, "was worried that his injuries would not be acknowledged because there was no documentation that he was exposed to anything serious."

Now, we have talked some about the importance of record keeping and how that could fundamentally change what happens in this area, but I want to talk about where we are right now and the consequences of the failure to diagnose early and what that means. Mr. Larkin, you are the one who has focused on this more than anyone.

I think you said in your written testimony that you estimate that about 80 percent of your son's exposure occurred during training. Is that right? That is what I understood.

Mr. Larkin: Yes, Senator. And if you talk to other veterans that have trained for combat, been in combat, they will pretty much confirm that the majority of their exposures is in the training environment, an environment that we can control.

Senator Warren: So, if I can ask you, we know about what happened to Ryan because he donated his brain postmortem, and they were able to do an analysis. But can you speak to what happened when Ryan was still alive, and

whether you and your family got the appropriate support that Ryan needed, as he clearly demonstrated that he was in increasing trouble?

Mr. Larkin: So, one thing I didn't share about Ryan is that after he passed, what we found on his computer were -- he downloaded numerous studies on blast exposure and TBI and also was researching the medications that he got. So, he was locked on this. I didn't like what he did. I didn't support what he did. But I have grown to understand why he did it. It was for his teammates. He was going to prove that something was wrong. Now, when he went to get help, he did it more for his teammates than himself.

But again, you know, we didn't know what we didn't know. I think a lot of people were trying to do their best for him, the best that they could, but maybe all the wrong way. And because we lacked the science, we lacked the knowledge. TBI was not mentioned -- I mean, very little. It was not taken seriously because they couldn't see it.

We still can't see this level of injury in a living operator or living warfighter, which is -- again within the medical enterprise, if you don't have a blood marker that alerts you, you know, just like a, you know, heart attack, we look at heart, you know, enzymes and so forth, that alert us that, hey, there is muscle damage and we see an EKG that tells us that, you know, things are going wrong.

But then when the heart -- we don't have that right now, and it handicaps our ability to triage these folks early on in the evolution, to your point. And the opportunity here, and I don't know if my colleagues would agree with me, but the opportunity that we have here is to get it at this early, not wait till it gets to a catastrophic, you know, point, you know, this disease process, the injury process where things have gone too far.

Senator Warren: So let me just pick up on this. I understand that this is hard to diagnose and that it is -- we collect data that will be one way to make it easier to diagnose. I understand we would like to start as early in the process as we can. But there is another feature of this that we have some control over right now, that when someone has any concern, who is the advocate to make sure they get the help they need?

My sense of this is it is just a patchwork. You go here, you get sent there, then you end up someplace else, and the patient is put in the position of having to advocate for a diagnosis, that it is not the patient's responsibility or expertise to have to make. I am grateful that Ryan did what he did in order to help his teammates. But ultimately, we have a bigger responsibility here.

So, I just want to know if you can speak just a little bit to the notion that starting now, before we have perfect

information, that we need a single way for people to go into this system, to be able to raise a hand, say, I have problems like the Marine that is quoted in The New York Times piece. I have problems and know there will be one person there who will advocate and at least get them to the best possible treatment that we can. Can you speak to that, Mr. Larkin?

Mr. Larkin: Yes. And I think the number one word that I would pick out is listen. The system needs to listen to these folks as they step forward.

You know, and we need to understand this is a leadership problem, and we need to educate leadership as to what is going on here so that they can properly usher these folks down the right paths, so that we can stop their injury process and that we can start a level of treatment that one size fits one, not one size fits all, you know, which is precision medicine. And I think as the science develops, as our medical capabilities develop, we are going to get better and better at doing that.

But again, Ryan became disenfranchised. He became, you know, adversarial because the system turned on him, a system that he depended on, a system I depended on. This was my community, too. And so, this is why I am here today. And I realize this isn't in a perfect world, but you know, the ultimate grader of what we do or not do are

the veterans, the warfighters, and their families. Are we doing the right thing for them?

Senator Warren: Yes. Yes. I very much appreciate that and appreciate your comments here. And if I can, I want to go to the treatment part of this. Dr. Zafonte, you work at Home Base, and Home Base tries to be the one place that brings people in and gives a response.

That is on the side of our servicemember, not hostile to our servicemember. You are on the front lines. You see people with TBI every day. Can you talk just a little bit about how Home Base has organized itself, and what you are seeing, and what kind of needs you have?

Dr. Zafonte: Well, Senator, thank you for the excellent question. And, you know, I think we see ourselves as a partner with DOD, and that we are auxiliary in an important and differential way.

That we take a look at the whole person. And what we try to understand is that, you know, I think Mr. Larkin captured it brilliantly, somebody is not just a psychological illness, but we bring multiple specialists to bear on this person for a very intense evaluation that might take, as I said, months or years in a standard environment, and try to emerge them in a team based behavior where we listen to the patients and we develop a programmatic plan to treat.

If we can't treat the microscopic injury right away, let's treat their symptoms and get them relatively well.

Senator Warren: I am so proud of the work that Home Base does, and I really want to underscore the importance -- there is help. There are things we can do. And I take it, if I can just have you underscore it again, Dr. Zafonte, you actually return people to active duty military service. Can you say just a little more about that?

Dr. Zafonte: I am happy to. Thank you, Senator. I think one of the most extraordinary things, especially for our special operators, is the very high degree of return to duty, return to the force, return to fighting. Because if you think about it as a person, that is what they want to do.

They want to be well and go back to their teammates and contribute at a very high level. And indeed, that is the goal. The goal is being able to give people agency over their own health again. And that is what we do.

Very high rates of return. Large numbers of people still waiting for service, which we hope to provide. And I think that we see this as a means of enhancing programmatic excellence and serving as that bridge for mid-career, early career people who really need a bolus of help.

Senator Warren: Early and accurate intervention, which I think is the point you make as well, Mr. Larkin and

Dr McBirney. I appreciate the work you do. Thank you.

Senator Scott.

Senator Scott: Thank you, Chairwoman. Dr. Zafonte, NFL players are wearing -- some of them are wearing the Q collar.

Dr. Zafonte: Yes, sir.

Senator Scott: Okay, can you tell me how it works and what you think of it?

Dr. Zafonte: Thank you very much, Senator, for that excellent question. It is an area of debate that is certainly of interest in the field of traumatic brain injury. The theory behind the Q collar is that a compression here at the neck, slight compression, would result in less force shaking within the brain.

Its role in blast related injury, I believe, unless Dr. McBirney has more data, is unclear. In sport related injury, it has received preliminary approval, although the enthusiasm in many investigators is modest.

Senator Scott: Okay. All right. Knowing what you all know now, knowing the service is the service -- so if you had a child or grandchild that was 18 years old, wants to be a warfighter, enlist in the, whatever, what would your advice be to him? You want to start, Dr. McBirney?

Dr. McBirney: Is not enlisting an option? And I mean that as a serious question. Traumatic brain injury is such

-- there is such a huge risk of getting this injury. And as we have heard today, detection of this injury, treatment of this injury is not guaranteed.

I would -- in sitting here, I now have a 14 month old daughter, so this question is very relevant. I would strongly urge her to reconsider her decision. And unfortunately, that is a decision that I know many veterans that I personally know have asked their children to reconsider as well.

Senator Scott: Mr. Larkin.

Mr. Larkin: So, Ryan is with me here today in spirit, and much of what I am saying is actually him talking through me. He would tell you he loved being a SEAL and he wouldn't trade anything. It is just that we got to do it better.

And I will say that my own Naval Special Warfare community, the SEAL community, Ryan's story has deeply affected them, and they have moved aggressively to try to make a difference, along with the parent Command, USSOCOM, right up to the Commanding General. They are leading the way, in my opinion, within the Department of Defense.

And very often, you know, what Special Operations does, the conventional forces follow. So, thanks, Ryan.

Senator Scott: Dr. Zafonte.

Dr. Zafonte: Certainly, I think this is a point of

great debate. But I guess what I would say, and we see this in contact sport, we see it in the military. The first we can do is know what we know to do now, which is eliminate unnecessary exposure. Rules changes in sports have made a big difference.

I believe we can eliminate unnecessary exposure in this population of people where there isn't a lot of return on investment, either to their training or for their long term health, or for their team members. And that would be an awfully good place to start in enhancing force health.

Senator Scott: Thank all of you. I mean, I don't think -- if we care about our freedoms, we actually don't have a choice. We don't have a choice. We have to thank God every day somebody is willing to put on the uniform, because if we get to a point where people say there is too much risk, then say goodbye to all of our liberties.

So, I hope we get to the point where, you know, nobody would say you shouldn't go in because of the risk. So, thank you.

Senator Warren: Senator King.

Senator King: Just a closing comment on that question, Senator Scott, you know, thinking about what you would say to your kid. One of my three kids is a Marine who was an eight year infantry commander, now a Marine reservist, and keep thinking about him and how he might

answer that question.

But as I think about the question, let me just recount an amazing story that I heard not long ago from Doug Wilder, who is the former Governor of Virginia, first African American elected Governor.

He was drafted into the military in the Korean War. And the military, like society at that time, was still dealing with an awful lot of racial prejudice. He was in a unit where there were many African Americans, many Caucasians, and others. And Doug is a guy who is going to stand up for himself.

And he had a commanding officer that said, I want everybody here to be treated fairly. And he believed, as did others in his unit, in the middle of some really difficult battle circumstances -- the African Americans in the unit were not being treated well and they all agreed they were going to talk to their CO and pass that on. And when they all stood up to do it, they all just said to Doug, okay, now you do it. And so, he laid out his concerns about the way they were being treated.

And his commanding officer said, you have done what I asked you to do. Now you all go back to work and let me do what I need to do. And things didn't change for about 3 or 4 weeks, and then all of a sudden one day everything changed because he did what he was supposed to do. He

stood up and he said, this isn't right, and we are a unit, and if we make some changes, things can be better.

And so, I would hope that people grappling with the decision, maybe your daughter might be in this position 17.5 years from now, but people grappling with the decision will realize things don't just get better, you know, by themselves. Things don't just change by osmosis. It takes people at all levels from the, you know, private first class all the way up to a four star standing up and saying, we will be better if we make these changes.

And I think an awful lot of our young people, or people at all ages, but I think a lot of our young people have a lot of wisdom to offer. And so, I would hope that they might still say, yes, I am doing this, and I am also going to be committed to speaking up if I see areas where we can be better. Thank you.

Senator Warren: Thank you, Senator Kaine. And I will be calling on you, as we are doing the NDAA, both to tighten up the rules on reporting and get more resources into treatment. That surely has to come out of a hearing like this.

So, thank you. Thank you all for being with us today. And I would like to call up the second panel. Thank you. All right, are we ready? Secretary Martinez Lopez, if you can give us an opening statement, please.

JOINT STATEMENT OF HON. LESTER MARTINEZ-LOPEZ, ASSISTANT SECRETARY OF DEFENSE FOR HEALTH AFFAIRS, DEPARTMENT OF DEFENSE; KATHY M. LEE, DIRECTOR, WARFIGHTER BRAIN HEALTH POLICY, DEPARTMENT OF DEFENSE; AND CAPTAIN CARLOS D. WILLIAMS, USN, DIRECTOR, NATIONAL INTREPID CENTER OF EXCELLENCE

Dr. Martinez Lopez: Chairwoman Warren, Ranking Member Scott, distinguished members of the Senate Armed Services committee, we are pleased to represent the Office of the Secretary of Defense to discuss the Department of Defense's commitment to address warfighter brain health issues and initiatives.

We are honored to represent the dedicated military and civilian medical professionals and the military health system providing support to our combatant commanders and delivering or arranging health care for our 9.6 million beneficiaries.

We will inform the committee about the Department's initiatives to understand the causes and impact of brain injuries and blast exposures, support ongoing training of medical professionals, inform the development of treatment protocols, and improve the cognitive and physical performance of our servicemembers.

The Department of Defense's primary mission is to defend the nation. Fulfilling this mission means

warfighters need the ability to make expedient and effective decisions on the battlefield.

Promoting brain health enables our effectiveness as a fighting force operationally, and mitigating the impact of traumatic brain injury in all its form is a top priority of DOD as we focus on near and long term health care of our servicemembers.

In support of these priorities, the DOD established a joint effort between the operational and medical forces called the Warfighter Brain Health Initiative. This initiative was finalized in 2022 to codify a policy and direction in support of unified efforts across the military to address TBI and blast overpressure.

The Warfighter Brain Health Initiative focuses on cognitive and physical performance, identification of known and emerging brain threats in military environments, and methods to immediately detect and treat brain injury. The WBHI Initiative is an important organizing function for our Department wide efforts to address brain injury and related diagnosis, such as PTSD and suicide.

Between 2000 and 2023, 485,553 servicemembers were diagnosed with TBI. The annual members of TBI grew from just above 10,000 per year in 2000, to a peak of 33,000 per year in 2011. The DOD responded to this increasing rate of TBI in combat during Operation Iraqi Freedom and Operation

Enduring Freedom through rapid expansion of TBI clinical care and research to support military forces around the globe.

We recognize, however, that more research and insight is needed in both the care and research dimensions to better understand the risk, how to protect the warfighters, and how to treat brain injuries more effectively.

Our strategic approach to this issue is an iterative one involving policy to coordinate clinical changes and gab driven research investment. When policies work, we look at how to refine for broader effectiveness. When they do not work as expected, we review why and modify them to invest in research to advance alternative solutions.

With that overarching policy mindset, we hope to discuss that we see as pivotal actions, research findings and their impact on our current approach as implemented within the WBHI. We communicate these insights not because we believe they are foolproof solution. Rather, enable collective action through shared knowledge.

We know there is still much to learn about the brain and not everybody responds in the same way to similar exposures or injuries. We seek to integrate solutions for the future as we provide recommendations to inform and affect change to safety, doctrine, and policy. This mission is more both personal and professional.

As providers, researchers, and military leaders, we are committed to mitigating the risk of and improving the treatment for BOP exposures and TBI. We appreciate your continued support of military medicine, and for inviting us to be here with you today to discuss the important issues surrounding the brain health of our warfighters.

We thank Senator Warren, Senator Scott, and the members of the subcommittee for leading continued Congressional attention on blast exposures and brain injuries, and we look forward to your questions.

[The prepared joint statement of Dr. Martinez Lopez, Ms. Lee, and Mr. Williams follows:]

Senator Warren: Thank you very much. I appreciate it, Dr. Martinez. So, I appreciate that DOD has begun to take steps toward mitigating the risks associated with traumatic brain injury.

Starting this year, new troops will be given regular cognitive assessments to help monitor potential impacts from blast exposure on their brain health. This will help medical providers recognize brain injuries and changes in cognitive function more quickly, and it will help servicemembers get the clinical help that they need. I am glad that DOD is taking this critical step, but it is important that we do this right.

Captain Williams, your organization, the National Intrepid Center of Excellence, works with servicemembers with TBIs and other invisible wounds of war. As you know, one of the -- and we have discussed here repeatedly today, one of the most significant ways that troops are exposed to blast overpressure is through training.

To ensure that we are accurately monitoring the impact of blast exposure on servicemembers' brain health, would it be helpful to give a cognitive test before the service member begins training and firing weapons?

Mr. Williams: Thanks, Senator, for the question, and thank you for the opportunity to talk about this important issue. Absolutely, yes. Let me start out by saying yes,

it is critically important.

Baselining is something that we utilize in all aspects of medicine for surveillance. We utilize it prior to treatment, utilize prior to modals that we know cause risk. So, we have moved to now -- this year, we hope to move to, all members, once they join the military and before they start the initial military training, they get cognitive testing.

They get cognitive testing, because we know that the highest risk of TBIs in the military are in the training environment. And so, it would be valuable, and we wanted to use the same precision medicine we have been using in the past for other modalities, that we do with TBI.

Senator Warren: Okay. So, if the baseline assessment is not starting until after training, that is not an accurate measure of the service member's brain health changes over time. We are going to miss the front end of this. And as we have talked about the importance of isolating the problem early is absolutely critical.

So, to make sure that we are able to detect signs of cognitive decline due to blast exposure, we have got to do this assessment before the training starts. Second thing, we also need to do regular tests of servicemembers' cognitive health after the baseline assessment. While Special Operations Command will conduct these tests every

three years, DOD is currently planning to retest troops only every five years.

Dr. Martinez, you are responsible for assessing the effects of and improving how DOD tracks blast pressure exposure. Would annual cognitive testing for servicemembers help increase the chance that we detect changes in cognitive function and detect them earlier when intervention would be more effective?

Dr. Martinez Lopez: Ma'am, the -- as the Department, we are looking into this. I think if there is value into doing it every year, we don't know. So, maybe three years, maybe five years. There is more data and more science that we need to look into. I am not looking at 10 year research.

I am looking at short term research to figure out what would be the best frequency of doing the test. And not only that, but what kind of other testing we should add to the battery to assess the condition of the soldiers -- the servicemembers.

Senator Warren: So, I just want to say I feel a little bit frustrated here that Special Operations Command already clearly says five years is not enough. They are at three. And frankly, until we have better data, I don't know why we wouldn't be saying, let's do an annual test and see what we can detect.

And if the data show us that three years is often enough interval to be able to detect changes, that is fine. But it seems to me, given what else we know, and given how catastrophic the implications of untreated TBI can be, that we ought to be erring on the side at least of collecting these data annually. So, I really want to push on this, waiting five years to test is just not often enough.

Another way that DOD needs to show that it is serious about protecting servicemembers from blast overpressure is by establishing effective weapon use safety limits. We had some conversation about this earlier. In 2022, DOD directed the services to establish a maximum allowable number of rounds for servicemembers to fire to mitigate blast overpressure injury risk.

Now good start, but I see two problems with this. First, the limits don't include brain injury risk. Blast pressure experts have raised concerns that this means that our current safety thresholds are built on things like whether or not it is likely to cause your eardrum to burst. They are very old guidelines, and they are not about traumatic brain injury.

Ms. Lee, you are in charge of overseeing DOD's warfighter brain health policy. Why is it important that DOD establish a maximum allowable number of rounds for servicemembers to fire that takes into account brain injury

as well as injury just to the ears?

Ms. Lee: Senator Warren, thank you so much for the question, and thanks for having us here today to be able to talk about warfighter brain health, blast overpressure, and traumatic brain injury.

This is an excellent question. We absolutely -- it is imperative that we have allowable number of rounds for all the weapon systems that are commonly used so that we can avoid unnecessary blast exposure in our servicemembers. We believe that this also gives us an opportunity to be able to ensure the usage is correct, the position, crew position, proximity, and all those pieces can come together.

Our policies are moving in that direction to be able to look at the brain. As you mentioned, historically, it has been through ear and lung. However, we are looking at what the brain effects are, and we will follow suit with our policies as such.

Senator Warren: So again, I want to say I feel a little bit of frustration here. I appreciate that you are working on establishing these limits, but we are going to get this off the ground now.

We know enough to start moving in the right direction. My office has heard stories of servicemembers having to take their own initiative in setting limitations for their

troops. We have got training instructors who just say, I have decided that is enough, and that is not enough to get this job done.

So again, I urge you better to make your best estimate and get started on forcing these weapons manufacturers to start collecting these data so that they will be able to give us limits on how they can be used.

One more concern here. It is how we measure these weapons use safety limits. DOD's own studies found that it took 70 to 96 hours to resolve servicemembers cognitive deficits after firing heavy weapons. So that is about how long it appears before people are back to their original steady state. But DOD guidelines say they are only going to test for the first 24 hours.

Ms. Lee, could servicemembers benefit from establishing weapons use safety limits for longer periods of time, like 72 hours?

Ms. Lee: Yes, ma'am. We are looking to expand that timeframe so that we allow for those differences that are coming up with blast overpressure. So that is again where our policies, the direction that our policies are headed so that we can cover that time period. We are firmly committed to early detection, provides the opportunity to treat, and that maximizes our outcome.

Senator Warren: Well, I hope you do this soon. The

Department of Defense's Inspector General has raised concerns that military health system providers are not consistently providing a 72 hour follow up appointment for patients with mild TBIs, so clearly, a longer time frame is something that DOD itself recognizes is important and that we need to get done.

Look, I get it, this is hard, and I am grateful that you are doing the work you are doing. I want to be a partner, but a partner that urges you to move faster and deliver more for our servicemembers as quickly as possible. We need to do better for our troops, and we need to do it right now. Senator Scott.

Senator Scott: Thank you, Chair. So, I will ask you the same question, what would you tell your son or daughter who was going to go in and be a warfighter, 18 years old, go enlist -- what would you tell them today, based on what you know?

Dr. Martinez Lopez: Sir, I have three boys. Two of them served in the military. One is still in the reserves. So, I am very proud of their service just like, you know, and I will tell my grandkids, I have eight of them -- so, that there is a great opportunity in the services.

And I think there is some value as a human being that we develop, that service to country is very important. Even if you do it for a short time, it makes a big

difference as you as a person.

And I don't care how you -- where you serve or how you serve, is it critical now? They need to understand that this is a risky business. And what -- so they need to come out with their eyes wide open, right.

So, my kids knew that .I very, very -- I made it very clear and -- but I am still very proud. I will tell my grandkids, if they really think about, there is something that triggers them to serve, go fetch.

Senator Scott: Captain.

Mr. Williams: Thank you for the question, sir. I have no children at this point, but I have many -- nephews, nieces, and friends of the family who I have encouraged to join the military. This has been the greatest honor in my lifetime to serve in uniform.

I wouldn't change that requirement for anyone or request to anyone. I would tell them to follow their heart, and I would encourage them to know that there are inherent risks to the job, and our job is to make sure that the people who you are entrusting your life to, they have a responsibility -- a responsibility to care for you. So, no different. And the reason why I am here today is saying we want to make sure that our men and women in uniform know that we are caring for them in every possible way.

Senator Scott: Thank you. Ms. Lee.

Ms. Lee: Yes. So, I have five children and one grandchild, and I would absolutely say to support and defend our homeland, to join the military and join the armed services. One of them is a Marine.

And through that service, it is about the trust. And I have seen working in this environment for the last 20 years, especially around the traumatic brain injury realm, that you really do need to be credible and have integrity based on that trust and ensuring that we are going to do right by you.

We are a family, and we are going to take care of you. Mr. Larkin is part of our team. We are all in this together with the same mission to take care of our people and take care of servicemembers that make the sacrifice.

Senator Scott: Thanks. Secretary Martinez, the Department's report to Congress on the longitudinal blast study says the Department plans to conduct a business case analysis and review lessons learned to inform its way forward with blast monitoring.

So, who is conducting the business case analysis? When do you expect the analysis to be completed? And what factors is the Department including in its analysis?

Dr. Martinez Lopez: Sir, do you mind if I defer to Ms. Lee.

Ms. Lee: So, the business case analysis kickoff

meeting was the 14th of February. It is being conducted by a contract service. We are expecting the results in September of 2024. We looked at -- we are looking -- we have extensively involved military departments in this so that the outcome that comes, the outcome and recommendations will be able to be implemented by the military departments.

Both the service communities and the operational communities are heavily invested in this business case analysis so that we can review the necessary resources, the -- and look at how to establish a standardized monitoring program throughout the force.

Senator Scott: When do you think you will be completed?

Ms. Lee: The business case analysis will be completed in September.

Senator Scott: September? Okay. Right. The '23, the Fiscal Year 2023 NDAA also authorized but didn't require the Director of the Defense Health Agency to conduct a pilot program to monitor blast exposure to the use of commercially available, off the shelf wearable sensors. Do you all plan to do it, and do you have any sensors in mind that you think are working?

Ms. Lee: So, yes, sir. So, we are awaiting the BCA results, the business case analysis results in September,

to make a decision on whether or not that pilot that could be the segue from our Section 734 work into a full blown standard monitoring blast program throughout the Department.

So, again, those decisions, we will probably make in the in the September 2024 time period. In terms of blast sensors, we have various communities to include the Special Operations Command that have been looking at the -- right now, the three available, commercially available products.

And those decisions are, right now, living in the acquisition world as they are doing suitability and fielding exercises, and based on the requirements of each individual community.

Senator Scott: Good. Also, the Fiscal Year 2023 NDAA required a report describing the strategy and implementation plan for the Warfighter Brain Health Initiative. I guess this was due at the end of last year or so. Is that different than the others?

Ms. Lee: That is the strategy and action plan that has five lines of effort. And I believe that is headed over your way right now.

Senator Scott: Oh, okay. All right. Thank you.

Senator Warren: So can I just ask one more question. It is seven months before the business case analysis. What are you going to do over the next seven months?

Ms. Lee: So, in the original memo that was produced before we had finished Section 734, the Assistant Secretary of Defense for Readiness put out this interim guidance memo. Before we had completed all of the information, all the data, we felt it was imperative to try to get brain health guidance out at that time.

So, we sent the memo out. Included in that four PSA memo are six actions to try to avoid unnecessary blast exposures. So, what we are doing in the meantime is updating that memo with more data that we have from our research studies and from the blast community of researchers, so that we can provide more direction and guidance to the military departments on how they can have safer actions out in the operational environment, in the training environment.

Senator Warren: Okay. I appreciate that. And how are you going to make sure that it makes it all the way down to the ground level? There are anecdotes that suggest that we make policy changes, we all talk to each other up here in the abstract, and then down at the ground nothing has changed. Dr. Martinez.

Dr. Martinez Lopez: Ma'am, the first issue is this is a joint effort between the operational forces and we in the medical sector. So, it is the medical leadership and the operational leadership.

If we don't work it together, this is not going to pan out. So, the way we exercise that at DOD is through a safety oversight council. So, we are meeting with all the services and laid out the guidance, and we rely on the services then to push it down. It is an issue of policy internal to the services.

It is an issue of training in the services. It is an issue of equipping in the services. And we will give them the medical guidance, you know, the best knowledge we have, but the implementation itself, how are you going to fire your weapon, where, and those kind of things have to be exercised by the line.

Now, I went over to Fort Campbell, and I talked to the CG of Fort Campbell. He was -- and I told him, it is simple. Less is better, and less often and better. So really look at -- pay attention to that.

Senator Warren: Right. Right. Captain Williams, did you want to add anything on that? Okay, good. Senator Scott.

Senator Scott: So, have you guys ever had a glucose monitor? Do you know how they work? Okay, so I can put on glucose monitor, I can put in my exercise, I can put in my food, and I can just do it myself. I can sort of track to see, you know, how I feel when my glucose goes up. So, why don't we have something just simple that people can do on

their own?

Because if I knew, gosh, I get headaches or I get, you know -- I have sleeping problems or I have any of these issues, then I would say, I mean, I can't do this anymore. I mean, why don't we do something -- I mean, the technology is so simple, right.

I mean, it is basically you just go you go to -- there is two companies that do the glucose one now that I know of. Why don't we just go there and say, will you give us the technology and we can implement this and just give it to everybody and let them monitor it themselves?

[Technical problems.]

Dr. Martinez Lopez: I am going to state the first steps -- [technical problems]. The problem with glucose is I know exactly where the thresholds are. So, I know that like at 126 it is abnormal blood sugars, so anything above that or below that, and I can monitor it. On this issue, I don't know what the threshold is. So, we haven't determined that threshold yet. And even worse --

Senator Scott: No, I will decide for myself. I will decide that -- the way I would look at it is, I will put the information in there and then I would say, hey, here is what I noticed. If I do this number of blasts, I get a headache. I do this number of blast, I can't sleep.

And so, then I start saying to myself, and I say,

well, okay, I am not going to do that. I am not doing that to myself anymore because -- you know what, this has happened to me so I am not an expert on this, but you would think, I mean, you know, we are all -- we are all going to be better if we self-monitor ourselves, right? I mean, rather than some top down program that tries to tell us everything. And even glucose -- I mean, your body is going to be different than my body.

So, what my high level should be is going to be different than yours, right. So, I am just saying, put the information in there. It is a real simple mode. Give it to everybody. Let them start following it on their own, and then they can easy -- you know, like on those -- anybody can connect.

You can say, oh, I am going to allow this person to connect. There is a company out there that allows people to do that now that -- it is call levels and they are doing they are doing -- I think they have 50,000 people or so on a study, where they are doing it on their own as a private sector, just with everybody voluntarily putting their data in there.

Mr. Williams: Sir, if I may, one of the most important things -- and what you are speaking about is really and truly precision medicine and targeted therapy to the individual. It is very variable for each individual

who has had a TBI, the symptoms that they have.

And so, one of the things that the past NDAA said was that the DOD needed to partner with private industry and private organizations to improve research and to improve treatment. And that is one of the things that we want to look at, is look at what type of modalities are out there, or that can be developed to allow patient to focus on their individual symptoms.

But we have to know what that baseline is first for that individual. Biofeedback is something that we do in the Defense Intrepid network, at NICO, we help patients understand how to control their own individual symptoms.

But if each person is different, then that is going to be a challenging, should I say, monitoring to create, but it is possible. And so, as we continue to do research, I think we can come -- we can get there soon.

Senator Scott: So, to me, I just gave you my answer, that is a big government answer. Okay, just my -- you might be absolutely right. Just, I am not saying you are wrong. I am just -- I just actually do believe that I will do a better job of monitoring my health than anybody else will ever do my health. I don't care what the study is, I will do a better job.

I think -- if I started -- I can just say personally, if I eat something and I don't feel good, I am never

touching it again, all right, period. And I assume -- I mean, it is smart -- these are smart kids going in the service.

And I mean, just look at these sports. All these people are getting smarter about this and saying, I am not doing this to my brain. And so, I just think we ought to do exactly all the things you are doing, but it is pretty simple to set up a program to give and, you know -- let the person monitor themselves because their body is going to be totally different than everybody else's. Like your blood glucose level is different than mine, I guarantee you.

Mr. Williams: So, I totally agree with you, sir. And as an internist and a pediatrician, I always listen to the patient. I always listen to the parents, right. It is very important.

[Technical problems.]

Mr. Williams: But I do want to say, though, I agree with you. I think as a medical professional though, and even as a researcher, we want to come up with a pathway forward for the patients to monitor their own.

And so, that means we need to come up with baselines, with normals, which we just don't have at this point in time for TBI in general. When we move towards blood biomarkers, when we move towards much more concrete evidence, I think we can come up with the tool that you are

talking about, that can allow a patient to monitor themselves.

Senator Scott: Thank you.

Senator Warren: Good. So, I want to thank you all for being here -- absolutely.

Senator Budd: Thank you all for being here. So, North Carolina universities, including East Carolina University, ECU, UNC Chapel Hill, and health care providers like Atrium Health have prioritized research, care, and support for servicemembers and veterans diagnosed with TBIs.

I was able to see that when I was in the State last week. So again, I appreciate this hearing. Further understanding the cause of TBI will significantly improve that care that they offer, and I look forward to supporting their ongoing efforts.

Dr. Martinez, in the longitudinal study on blast pressure exposure of members of the armed services that you published in December, one of the key findings is a greater likelihood of TBI -- can you explain what you mean by a greater likelihood and quantify the increased likelihood of TBI? So, what percentage of people were exposed to what level blaster, likely to develop TBI?

Dr. Martinez Lopez: Senator, I will defer to me Ms. Lee for the answer.

Senator Budd: Certainly. Thank you.

Ms. Lee: So, the Section 734 longitudinal study that you are referencing, where we looked at monitoring and documenting blast exposure and then also offerings a review of weapon systems, which we codified as 15 weapon systems that were most commonly used, and we went deep to figure out what all the safety regulations were about those.

And under the safety rubric as well, we looked at what the health and performance effects are, the brain health effects from all this blast overpressure stuff. And in the report, we were able to -- we reviewed 40 studies. 26 of those studies were funded by the Department of Defense.

And we looked at what type of effects happen when you are doing blast overpressure, and then where do you have concerns about traumatic brain injury. And most of the areas that we found correlations were in the neurocognitive and thinking areas.

Also, in some health care utilization areas. We looked at blood biomarkers and proteins to try to see if there was any correlations, and we believe that that will bear fruit, but right now there is no clear trends in that regard.

So, we are relying on the symptom reporting as being the most indicative of someone that would have had a traumatic brain injury, and again, early detection of that

through evaluation of multiple domains like their balance and their eye movements, and their thinking skills, and their symptom reporting.

Senator Budd: Thank you for that. Dr. Williams, what recommendations would you make to improve the Department's ability to diagnose and treat military personnel who are repeatedly exposed to low level blast?

Mr. Williams: Thank you for the question, Senator. As we spoke earlier in terms of baselining early. So, it has been stated several times, and when you know better, you do better. One of the most important things we can do is baseline our members from the moment they come into the military.

And so, that means before they start the military training. And that allows us to follow them over time. I admit we have to find the right baselining tool. Right now, we use ANAM. ANAM focuses on cognition and that is an appropriate component, but we can do more. We can do better. And our goal is to, again, start early so we can continue to monitor.

Senator Budd: Thank you. So, North Carolina is the proud home of the Kennedy Special Warfare Center and School at Fort Liberty. And research suggests that Special Operations forces experience higher rates of blast exposure in training and combat than other military personnel, and

thus are at an elevated risk for repeated blast exposure related brain injury. So, does that track with your research?

Ms. Lee: Absolutely.

Senator Budd: All three of you?

Mr. Williams: Yes.

Senator Budd: Thank you. While we certainly need to conduct more research, we have to also do a better job protecting our servicemembers with what we know today. That lines up with Dr. Williams, with what you were just sharing.

So, I am concerned that the Department is not moving quickly enough to address these TBI risks. So, there is tested, FDA approved devices that can limit TBIs, including some like neck collars that are currently being used by Special Operators and just like you see in the NFL.

Now, I am hearing, however, that there is still years of DOD testing that need to take place before they can be fielded for the broader force.

So, for the panel, for each of you, why aren't we expanding the fielding, FDA approved wearable devices now to keep our warfighters safer from TBI inducing head trauma and overpressure protection, rather than waiting for duplicative testing to be completed within Department? And how can we expedite those devices, the use of those

devices?

Mr. Williams: You know, I would start with a simple answer, our goal is to do no harm. And so, right now we need more information for some of these devices to determine if they would do harm in the operational setting.

Senator Budd: Even, doctor, if they are already FDA approved devices?

Mr. Williams: I totally understand. FDA approval, oftentimes, is not tested in our population, and that is a different story. So, we realize now that a lot of times this research is being done and is not inclusive of operators, especially high level operators that we are caring for. And so, I think our goal is to make sure we do no harm to that general population.

Senator Budd: Thank you. Secretary.

Dr. Martinez Lopez: We may have to look at the data and we look at the size, if it is sound. Even in our study, we will adopt it. If it is really going to make a difference, we will. But we will put them through our internal processes. And that is true for every intervention we do have with our patients.

Senator Budd: And Ms. Lee.

Ms. Lee: Senator, the jugular vein compression devices that you are speaking about had mainly been studied in head impact in the sports community. So, pivoting to

blast overpressure, which has a different mechanism of injury, is worth a look -- definitely worth more than a look -- to do more research to make sure that it is safe and effective in both the military population, as well as blast overpressure as the mechanism.

Senator Budd: Understood. Thank you all. I yield.

Senator Warren: Thank you, Senator Budd. I want to thank you all, all of our witnesses for being here today. I want to thank you for the work you do every day. My takeaways from this are that the Department of Defense needs to do better.

We need to identify those who were most at risk for TBI because of the particular work they do. And we need to collect better data, and we need to do all of this on a much faster timetable.

Congress also needs to do better. We need to make sure that you have the resources to do your work, and we also need to make sure that those who are treating TBI like Home Base have the resources they need.

It is shameful that there are active duty military who have what appears to be TBI and they cannot be treated because the resources simply are not there. A waiting list at a place like Home Base is our failure.

We need those resources, and we need that capacity to be able to treat those who have suffered brain injuries

because of their service to our nation. We owe that to our servicemembers. So, again, thank you all for being here. I want to thank the senators who have been here.

I want to thank my partner, Senator Scott, in this. And this will be an issue we will take up during the next round of NDAA negotiations. Thank you.

[Whereupon, at 5:02 p.m., the hearing was adjourned.]

WORD INDEX