

How many of you are actually in primary care or direct care like you are a D.O., M.D., a nurse, or in that position. You apply direct application of treatment. Okay. Thank you for letting me know. I'm curious to see if there's any wonderful feedback as I'm giving my talk. Sometimes I realize that I'm on the cusp of the crossroads between psychological information, and biomedical information. Always open to and it looks like we're doing a little bit of technological okay, something just popped up online, little delayed, I'm okay. [Laughter]

It's asking me if I use my phone, okay, sorry about that delay. We are having some audio, okay, I think we are okay there.

Sorry, we're just trying to get people connected.

Okay, I can stand by, Linda if you need that.

Yeah, just so we don't interrupt you, if you would just stand by one minute.

Everybody can have a cup of coffee, that's what I'm doing.

Okay, can everybody who is having trouble just a few minutes ago, are you okay? Okay, great. >> Okay, I think we're back. [Laughter] [No audio].

Wonderful, so one of the things I explained to folks, I am a licensed clinical psychologist by training. And I have about 18 years of service working with veterans, and acted duty service member. This loss over clearly because so much is learning about the Biopsychosocial model. Although my area of expertise is in clinical psychotherapy, I am educated on the generalities of a little bit of neuropsychology, and middle part of health psychology and if while I am commenting on these functions, I'm always open to having folks add their knowledge in the chat box. Because some may be up to par with some of the literature and I invite you to use the chat room. I make pots for questions throughout my talk today. But I'm perfectly comfortable if you would like to type something in the chat box while I'm speaking. And Linda has been very good at cutting capturing in case I miss it in the chat box. I'd like to be able to ask that question while it's fresh in your mind and hold it in your working memory and miss out on receiving other content.

So, thanks everybody, I am Dr. Mc Chesney. We are talking about pain sex and gender.

Just to certify I Dr. Kathleen McChesney have not or my spouse/partner or any immediate family member have not in the last to expect to have any upcoming months of financial involvement. This certifies that the views expressed in this presentation are of my own and do not reflect the policy of the Department of Army/Navy/Air Force, spaceport, Department of Defense or U.S. government.

So, going through my outline I wanted to spend some time at least breaking the stanza that we have an awareness of why I'm going through some of these subjects and topics in particular. In order for us to

really apply the biopsychosocial context, I think it's extremely important that all of us recognize this is a significant paradigm shift. And, in so being we have acquired new vocabulary, new ways of labeling and describing our experiences. So first of all, as I will be making sure we review the fundamentals of the biopsychosocial paradigm which is most effective in helping treat patients of issues with such issues as complex pain. And essential definitions and the need to differentiate the issues, that is crucial in this day and age specifically now that we are struggling with the me too movement, the Black Lives Matter movement, the transition from offering a generalized one type of care to all, there's becoming now a greater emphasis on individualized patient driven care. So, in so doing, I want to clarify such definitions to help us better learn how to communicate what we are observing in our rooms.

I will talk a little bit about gender trends. I have a lot of statistics that maybe exciting, but just to update folks on data collection that's been happening over the last 20 years particularly with the conflict happening in the Middle East. I will also talk about epidemiology, and the difference between military and veteran populations compared to the civilian sector. Then I think it gets a little interesting. I'm going to be speaking directly to sex-specific factors particularly as we look at the female brain, and female physiology from male physiology, and some hypotheses or theories as to why these two sexes may prevent quite uniquely given there's circumstances even if the conditions are relatively the same. And then normally, if we were in person, would do some form of role-play dialogue. This is not going to be as easy in this platform, I absolutely will most likely invite some Q&A and the opportunity for greater discussion.

So. Most of the studies that I will be reviewing today, really only examine biologically confirmed sex or gender consistent sex identification. There've only recently been studies on transgendered individuals, and I look forward to reviewing more studies that are looking at in particular the changes that occur due to individuals in biological and physiological transition from one sex to another. Nevertheless, as I'm referring to the difference between males and females, I'm referring to the clearly stipulated sex differences that the data was collected. This says the LGBTQ identity comes with a cultural distinction that patients may or may not identify with that we must be mindful of even when we are focused specifically on the sex of the individual. We need to be sensitive to the patient's beliefs, and their personal identification and level of integration in a culture beyond that of their identity with regards to sex and gender.

All right, so moving on. If you have been attending the Pain Skills Training workshops for quite some time you are familiar with the bio-Social Circle. It is complex and is highly subjective. We recognize that psychological factors and environmental factors influence [Indiscernible - static], ending modularly our pain perception as well as how we choose to react. It's one thing if I step on my child's Lego in the morning, and am cursing and kicking it across the room, it's a different experience altogether if I am in a combat zone, and I'm recognizing that I've been shot at in the midst of a conflict. The environment, the level of arousal that I may be experiencing, may all be contributing to how my brain is

trying to process what just happened, what does this mean and what can I do about it.

So, input from our peripheral sensory receptors combine with our interpretation of the event associated emotions, expectations based on prior experience, or how we have been trained to respond to injury, and I think we have a hot mic in our audience, is there a way we can mute our mics? I appreciate that, if there is a way someone can make sure all phones are muted, that would be ideal. Thank you.

Okay. So, as we are processing this information, whatever emotions, whatever thinking processes have been online at the time of injury fire together at the same time. So many of us have probably heard this dialogue before, that nerves that fire together, wire together. And essentially what can develop is not only a declarative memory of the inexperience that resulted in injury, but also a sensory motor experience. We've also heard the phrase, muscle memory, and yet when it comes to the pain expense, we recognize it is not only a sensory motor expense, but also highly emotional, and it is one of the only sensory experiences that we know of that is tied to survival, danger or threat for life or limb. So, it is powerfully mapped onto our plane and there is a go beyond the sensorimotor cortex. This is one of the reasons why we see our patients presents, that seems to be such a unique level of distress. Pain has to do with survival unlike many of our other senses.

So, as we start to dive into the unique differences of individuals, we have to recognize that it differs across individuals for so many different reasons. It becomes almost impossible to tear apart how unique presentations can be. And for those of us who work in pain management, no two people with the same injury present in the same way. I think this is what makes our work interesting to so many of us. We have to take into consideration the social cultural history of the individual that walks into the room. How he, or she, or they perceive the meaning of pain between each other, and their colleagues, or coworkers. Because this creates a context through which pain will manifest. Pain does not occur in isolation, and many of the seemingly automatic unconscious pain behaviors we may observe could very well be a result of the environment, and the social need to be seen and understood. And that may have been shaped, rewarded, reinforced or punished throughout the individual's history based on their private experiences.

We also recognize anatomical sites and biological processes through which pain users experience differently as I said. They are influenced by other co-occurring processes in the brain.

So again, it impacts the pain experience uniquely, in the transition from acute to chronic pain. The extent to which I am understanding what this means is based on my history, and whether or not this continues. Or stops. The development or exacerbation of psychological symptoms are involved, chronic illness, treatment planning, and the prognosis of our patients.

So, again, what are we trying to do here today? We are trying to use the biopsychosocial model to address individual cases uniquely. Particularly

as they pertain to members who identify with different sexes or genders. So again, I hope I invite everybody in the room today to really feel comfortable and free asking questions, engaging in dialogue, offering up knowledge and wisdom from their experiences because we know the best learning experience do not happen in a vacuum, it happens with dialogue.

All right. So, let's start by beginning with certain definitions. Essential definition so that we are all on the same page. And just to know, a lot of these definitions have been gathered from American Psych Association DSI. If were talking about sex, by definition sex is defined as a genetic, hormonal and anatomic characteristics that determine whether a person is a biological female or male, it's typically defined by the physical assessment of genitals.

Gender rather, is defined as an individual's innate sense of being male, being female, or somewhere in between. We also understand the term gender role, meaning does one take on a feminine role, masculine role, a binary role, and neutral role? And also, how did they demonstrate socially? How does the individual express outwardly their identification with their sex, their gender, and their role? And so, for those of you who are already getting confused, standby, we have some interesting ways of mapping this out. Many of us, for example, are aware that if biologically and on the medical record our individuals are categorized as a certain sex, that does not mean we assume it upon our assessment. It is so valuable for us to make sure we engage in a dialogue to confirm how the patient identifies themselves. We cannot jump to conclusions, especially given the nature of our patient population, as well, whereas there may be many biologically female patients who may present as a different gender, or who may identify, or express themselves in one way, yet describe themselves and their identification in a wholly unique, and different way.

So, I do have a question out there for everybody. Anybody have any ideas of how military cultural changes with the growing invitation to have more women in list impact what you see walking into the room? So, for those of you who have maybe been in practice for quite some time, how many of you have noticed, or seen changes given the increase of female patients in your room? That's a challenging question. So, if you've seen some changes, if you've seen some unique presentations, please raise your hand, would not be a surprise given how many more women we've seen enlist and sign on over the years. Yeah.

Okay. Clearly, as the culture of the military has changed, we may also be viewing them or we may have seen over the years, and evolution of how our patients express their identity, more fluidly, raise your hand if you've seen that evolve over the years.

Okay. I love the commentary, let's see, we are somebody, yeah, Tim, with the addition of female, into the infantry particularly here at four Ft. Bragg, see more of them injured initially training here shortly after arriving. We will review that, pictograph of the skeletal presentation of our female patients versus our male patients. I've had the privilege of working with some senior female enlisted folks, who at the time that they initially signed on, were in the system, in a culture, that did not

accept, approve, or acknowledge being a lesbian. And she had to keep that under wraps and closeted. This particular female was unfortunately a victim of a male to female sexual assault, and in her defense, she was unable to explain to the legal supporting others that there was no way she brought this on or encouraged the activity because she's not attracted to men. She had to keep that under wraps. And as she stayed in and served further years, she became more comfortable because the "Don't ask, don't tell" policy in later administrations happen, and then we had the transition into, kind of keeping that hush-hush. Then it opened up and later administrations of being able to make sure your significant other and your marital partner has access to all of their benefits.

So having that opportunity to work with this particular individual who was out, then in, then out, then in, really explained how gender expression can be completely different from how one identifies as their sex, as well as their role, and their gender, completely.

I will be touching upon a little bit later down the road that new research is revealing some unique differences in the pain experience depending on if a transgendered individual is in the process of transitioning from male to female. We do see some unique changes within individuals that we will touch upon later.

So, I'm going to quote a statement from one of a cutting-edge feminist at the time had coined for these unique differences with privilege based on whether or not you were member of a majority population, "When we discussed race, sex, or sexual orientation each needs to be described as a power system that creates privileges in some people, as well as disadvantages in others. Most literature is focused on disadvantage or discrimination, ignoring the elements of privilege." A unique quote that I want to pose to the audience particularly when it comes to understanding the role of femininity versus masculinity among the military culture.

So, I believe it would be fair for us to recognize that the Armed Forces traditionally have enlisted, recruited, and facilitated masculine capability. However, with the evolution of any culture as an adopted change, there has been a process of finding ways to adapt and accommodate those individuals who may have not been able to adapt prior. And in so doing, like the case example I just gave, we may also be looking at the difference between the privileged and the unprivileged based on whether or not this individual was accepted as a member of the in group, or the outgroup. So, when we are working with members who identify as the nondominant sex, it would behoove us to be wary of some of the delicate subtle and implicit impacts being a member of a dominant culture may have on this person's comfort level and disclosing what's happening, and their flexibility for trust in disclosing what is happening, particularly if there is a difference between their identified sex, and that of the provider.

Alright, moving on. Intersubjective differences, gender biases, alone among and between patient providers impact relationships expectations and approaches. There actually has been interesting studies that for better or worse, we have learned that the gender of the provider happens to be

female, the gender of the patient is less significant, both feel more apt to trust and disclose than if the provider is male.

To kind of highlight this particular fact here, we recognize that women in general tend to catastrophize more, where men are more likely to have as self-efficacy and an increase sense of capability. What does it mean? What does this suggest?

Especially in a culture where this may mean that the ability to complain or become emotional is discouraged, there may be a power differential or a judgment call on to whether or not this patient is under reacting or overreacting, not being strong, or being weak. We have to take that into consideration. Psychosocial processes such as early life exposure to stress, acquired pain coping behavior, stereotypical gender roles, or family members with pain conditions, are also psychosocial mechanisms that are going to influence that shows up. And we know that early exposure to environmental stressors such as, what we are familiar with in the ACEs study influence variability and pain reports that we see later in life. For those of you who are not familiar with the ACEs work, I had mentioned it in my lecture yesterday, this study was a longitudinal study conducted with the cooperation of Kaiser Permanente, and UC San Diego, where patients were actually asked to complete some demographic information on how many adverse childhood events they were exposed to early in life. And what we were able to notice in general, that were the more individual events up patient was exposed to, the more likely they suffered from chronic illness or health related problems.

So, for example, we are aware the childhood abuse is linked to adult complaints of chronic pain, and increased pain sensitivity in women. One of the beliefs about femininity versus my masculinity, pain expression and sex-related expectation are more commonly accepted and fostered in women, and this is a dynamic, we've also seen when we are talking about race, ethnicity, and multicultural differences. Ironically, it usually those in the minority groups that may actually have greater flexibility and fluidity in expression given the fact that they may not be representative of the power structure that is already established right? We've seen this in certain studies. Clearly. Sex differences and pain sensitivity may be influenced by sex-related expectations, regarding performance on a particular test, so we recognize that gender motivated regulation may be influencing pain expression.

By show of hands, how many have seen that in some of your patients who are male? I know for me, by the time many of my male patients arrive, they are embarrassed, or humiliated or humbled because they never thought they would have to come to a psychologist to start working on some of the things they thought they could emotionally suppress.

There's definitely that belief among so many of our male counterparts that you don't need to express, there's no room for emotional expression and I see those hands. Fantastic.

Okay. So interestingly enough, one more bullet point here. When we start thinking about the difference between biological sex is, what we are starting to learn is that men tend to use behavioral distraction and

problems focused tactics to manage their pain more so than women and yet women tend to use and recruit more social support, positive self-statements, and emotion focused techniques to cope with their pain. Women may lean more into cognitive interpretation changing the meaning to help the process. So if we think about certain types of coaching, therapists, social approaches to help our patients, it may benefit us to think about if my patients identifies as female, I may want to engage that patient in more acceptance based emotion focused therapy, affect, or cognitive related treatment, whereas with my male population I may really want to work on things like pacing, on practicing lengthening their fuse, managing behavioral reactivity and engaging them in distracted activities to help with their attentional focusing. Just some suggestions out there.

All right. Let's look at some trends when we're talking about sex and gender differences with mental illness because this will affect, again, what's walks into the door if they have a pain issue. I'm going to give out some stats here. If we are looking at clinical depression, it tends to present one and a half to three times higher in women. And although suicide attempts are more commonly seen in women, completed suicides are more commonly seen in males. If we are looking at anxiety, there's a two to one ratio female to male, generalized anxiety, to the one female to male, illness and anxiety is about equal.

If we are looking at things like PTSD, it is more prevalent in females across the lifespan and experienced for longer duration of time than it tends to be in a male patient population. So, let's look at gender trends and color comorbidities. Insomnia, about 1 1/2 to one female to male where woman may have more difficulty. If we are looking at opioid dependence, it's interesting to note that opioid use disorders reach its highest level of prevalence between ages 29 and younger, and interestingly enough, there's some preliminary data to suggest that female adolescents are at greater risk of developing opioid use disorders than male adolescents. However, if you look at the stats here, non-heroin opioid abuse seems to be more predominant from male to female, if we look at heroin in particular, there's a 3 to 1 male to female ratio altogether. But let's take a moment to realize the age range of our patients. Many of them are in their younger adult years and range from 18 adolescence to 35 or 40. Keep that in mind.

Here are some gender trends with pain and pain conditions, approximate male to female ratios. Female to male, 4.8, so approximately anywhere from nearly 5 to 1 to 6 to 1 we tend to see fibromyalgia more so from females to male. Irritable bowel syndrome, 2 to 1 ratio. Migraine headache, 3 to 1, chronic tension type headaches, 2 to 1, temporomandibular pain, 2 to 1, interstitial cystitis 5:1. Osteoarthritis, 1.3: 1, rheumatoid arthritis, 4.5 to 1, lupus 9 to 1, and myofascial pain, almost 2 to 1. Where we start to see this interesting crossover is the comorbidities between mental illness and stress is 2:1. So, we see unique presentations that are more likely psychological, emotional, and cognitive female to male.

So, interestingly enough, if we are focusing, on migraines, and I just want to take a little side conversation here, another way of looking at this, this lecture, I got this information from Dr. Alexander at the

University of Arizona she gave an interesting lecture in 2017, one of the things that you, focused on you was that three out of four migraine sufferers are female. And that differences start to emerge at puberty. Prevalence peaks during reproductive years between the years of 18 and 29, our patient population, and yet they start to decline after menopause. Any guesses out there as to what may be playing a role? Put your answers in the chat box. I'm very curious. I'd love to see people typing, if they can. Yeah, why might that be? Any guesses? Yep. So, thank you Jennifer, hormones play a huge role. That's a takeaway from today's lecture, stand by there will be more on that. At least 50% of woman's migraines experienced menstrual related migraines 2 to 3 days of onset, ladies, and up to 80% of pregnant women experience complete remittance of migraines during their third trimester of pregnancy. So, we are talking about an abrupt shift in estrogen levels within the female body. Nearly all experience a return to migraine patterns postpartum. So, again this abrupt withdrawal of estrogen we believe is related to potential migraine attacks.

Interestingly enough, when we are talking about headache pain, only cluster headache appears to be more commonly seen in male patients than female patients. If we're talking about issues like temporomandibular or TMJ pain. Gentlemen, that does seem to be more severely reported than women. And, interestingly enough, again, women the prevalence seems to be more commonly seen during the reductive years and declines after menopause. In terms of osteoarthritis, we recognize that being female generally puts one at an increased susceptibility which we suspect is associated with estrogen deficiency. So, let's draw a link, osteoarthritis a generative condition and the female musculoskeletal system. Hold that in your working memory as we start to talk about some of the injury that another patient brought to my attention, we are aware that their unique factor for our women patients. And then lastly myofascial pain. Interestingly, patients age 30 to 60 seems to be more common and associated with poorly developing, and developing myofascial trigger points.

Any questions on the stats before I move along? Now the stats are again based on the APA DSM criteria, and common information we know in the general population. I do see a participant is typing a question. Please.

Okay. If a male is receiving estrogen, can they have the same side effects we are discussing here. Lori, I love it. Stand by. That will be later in the lecture, and I will be talking about more of the male to female estrogen use issues. If I don't, holler, and really will wave your flag, okay, we'll come back to that. There seems to be general evidence to suggest the answer is yes.

Okay. If we start to lean in and narrow now our focus to epidemiology in the military and veteran populations, it's fair to say the following are generalized summers, and I will go into more specific research data as we move along.

In general pain is more commonly seen in our female patients, particularly headaches, oral facial pain, musculoskeletal pain, and abdominal pain. So, by a fence out there, for those of you who are

bedside providers, and anecdotally, does that seem to be jiving with what you have seen? By a show of hands, I'm curious.

So, even though maybe, your number of female patients is lower than male patients, do you notice whether or not you seem to have greater complaints of pain in your female patients? Thank you.

Women suffer from a higher prevalence of depression, anxiety, and adjustment disorders. Makes one scratch their head, wonder why, we have to take into consideration the biopsychosocial model here. They are high injury rates in basic training and active duty. So, to Tim's credit, we recognize there seems to be a lot more injuries that occur in our female folks just from their training, and their boot camps, and their basic initiations more so than men. We are also aware that there are higher rates of sexual trauma male to female, that there's a direct correlation between sexual trauma and gastrointestinal problems chronic pain, abdominal pain, G.I. problems in the future.

So, here's an interesting observation as well. I believe, you know, generations that are baby boomer providers are preparing for retirement, but we still have many providers that are more comfortable and more experienced working with a predominately male patient population. And it stands to reason given the nature of our military in general, right? This is not pointing fingers it's fact, many military and VA providers have a greater breath of experience treating the male population just due to the nature that we didn't have that many women enlisting. And so, that being said, those of you may be aware that we are now finally trying to add more women's clinics, or clinics that are more focused on women's health issues that are unique to the female sex.

Okay. I'm going to skip this slide only because, I was not able to find long-term research and I think it might've been a wonderful study, with a lot of preliminary data, we have a lot of valuable data that is absolutely secured here, and I'd rather spend my time on that.

So, yeah, in general culture has change the military population. We recognize that more women serve the front line under direct flyer. Women carry heavier loads and participate in strenuous training, they have higher injury rates in men in initial and treat training, and women are particularly prone to specific injury such as stress fractures. So, I asked the crowd out there again why may that be? Those of you experience providers why do you suspect women are particularly more prone to stress fractures? Any guesses? Anyone? I see Tim typing. Hi estrogen, low testosterone. That's a very deep thought. I think it's more practical than that point, there has been some speculation, and please add more thought, Kristin, I see you typing in there too.

Smaller body frames, hip angles. Laurie says Nutrition. You are both on the right path. Yes. Any other thoughts? There's a lot at play here. I see Nicole, and it looks like, Yep NAS, forgive me if I ruined your name, women have to march at the same stridently as male. Brilliant, I like how you're seeing this, these are all contributing factors, smaller build with heavy equipment, yes, keep going, all of you are on the right track, although estrogen plays a role to them, you know, we often deal

with the practical issues, size of the gear, so yes, yes, and yes, there seemed to be some speculation although there is evidence in initial data collection. If we think about the average adolescent, or teen female, and social pressures to maintain a svelte diet it then healthy fit body nutrition is absolutely playing a role, and many people speculate that minimal nutrition may have been playing a factor for some of our really small framed thinner recruits. Within also see commonly, that the level of intense fitness is unique for many women, that may be dependent on the culture they grew up in, how they were raised to engage in exercise or fitness. We also recognize, and I have seen this firsthand, although, the military is improving. There has been a dearth of access to appropriately fitting gear so many of my female patients did not have proper boots that were the right size. They did not have proper fitting vests that were the right size, or gear that accommodated for their breast size.

And so, between that and the level of gear, and also the risk we are talking about, the sheer density and size of the musculoskeletal frame, I've also seen very slight, very small, framed women being selected by their detailers to become damage controlmen. It makes one scratch their head, why would you make someone so small responsible for caring 80 pounds of gear and running up and down ladder wells, where they don't have the ability to do this despite their stature, this is an interesting time, where we don't want to deny anybody opportunity, but we need to recognize that gear needs to fit properly for the shape of the body for where the strength has been built.

It's my understanding, they are trying to adapt some things that will be more suited for the female figure. Tell me if I'm wrong, these are the one of the things we are aware of, the last thing is gear is heavy. Depending on how much the female frame is used to tolerating, we find more compression damage.

So given that we have a larger number of female veterans, the DOD studies that I'm going to review here have identified certain risk that others for injury like I said, lower-aerobic fitness, previous injury history also play a role. So, for a while we've been seeing a greater number of women enlist, we also see a greater number of women seeking care. So, this interesting chart here is a general kind of distribution of the number of female patients seeking care, and how that's increased. So, the orange line represents fiscal year 2001, and the blue line represents fiscal year 2010. If we're going with the statistics that were collected around 2012 - 2015, over 2.2 million women veterans exist, I believe that number is probably increase, and in 2013 over 390,000 women utilized VA healthcare services.

Women veterans using VA services have been increasing approximately 7% per year which results in a 60% growth of women veterans using VA healthcare benefits. And this was collected between the years of 2009, and 2015. And as I mentioned before, given this surge of numbers in the female population, this is why we are seeing greater effort to provide unique care specific to the female anatomy and, we now see the growth of 154 medical centers for women and 985 outpatient clinics that can help specialize in women's medical outpatient care.

Let's talk injuries. Women are three times more prone to stress fractures than men. This goes back to what I asked, poor nutrition status lower level of a bow but fitness. Rapid progression of intensity during exercise, advanced age and history of stress factors. What is it about advanced age, any guesses about that, put your answers in the chat box, why might we see higher numbers of older women?

I'm not sure about osteoporosis, Lori. The literature interestingly enough, suggests that many women may have started families, or for certain reasons, were in the position that they needed financial stability, economic security, and benefits for children. And so, there is some speculation that many women enlist in their late 20s or 30s after they have started a family, or when they realize they want to start a family and maybe they've become a single parent. Interesting, right? Again, it suggests some interesting dynamic historically about which sex, which member is more responsible for raising children, and who tends to have greater responsibility for raising a family, where can one acquire the resources to do so? All right.

I want to get a feel for the audience out there. I want to ask Laurie, if you're out there, I'm sorry excuse me Linda, if you're out there, we ready for a stretch break, do we want to take a poll into people want to do a stretch break.

Sure, is a raise hand if you need a stretch break. About a 10-minute refill coffee stretching. So, I guess so, how about 10 minutes? 10 minutes, all right, everybody, we will see you all in 10.

We're back everybody, I hope everybody had a chance to wipe away the cobwebs, I know this information is not the lightest, so I appreciate you coming back in the room. You know, a lot of this information that I originally collected, I was able to pick up from the joint commission that was responsible for the study of these particular subjects. And so, some of the data I recognize is a little old. I really am looking forward to seeing if some of the statistics change. And so, according to some of this recent literature, I guess it was collected sometime around fiscal year 2013, up to one in four women report sexual trauma while in the military. Now, what's interesting here that we are aware of, is that it does not mean it does not exist amongst men. And again, if we're talking about culture, the biopsychosocial model expectations about what one's role is, whether one is masculine, or feminine as these things continue to evolve, we are aware that although military sexual trauma does indeed occur with men, there may very well be expectations, and cultural beliefs tendering a male's ability to feel safe and comfortable disclosing his history. So, I always take this data into careful consideration.

Okay, I see a question by Kristen, here, can you explain sexual trauma, does that include harassment as well? You know, it's a really good question, and I don't know if I have that answer for you. My assumption is that it most likely more than harassment. Most likely physical assault, or rape according to what I have read thus far. And the reason why I suggest it has to do with more physical assault, or rape is because the data is looking at physical pain, and medical complications as a result, not that harassment does not cause harm, right? I think they are

looking for more some concrete outcome data is my guess. But then again, I haven't had a chance to review exactly what these patients were queried on or what they were asked, a very good question.

So, if you look here, for fiscal year 2009 you have clearly significant difference, between women and men and also the growth in reporting of 2009 and 2013 the result of the increase in men, now is it a result of our patients being able to speak out, or it is outlining some other shift that seems to be occurring because we do have more women coming on board, could be compound, and I'm not sure to which these studies were able to tease apart those compounds. Good question.

Let's look at sexual trauma and pain. And it may have been a question of any type, to be honest, it's not clear to me but, what I can tell you is that according to what this particular study is looking at, this particular study that indicates the outcomes of the slide was collected at the VA Connecticut Women's Care Center between October 2004 and March 2005. This was a study of women veterans receiving outpatient primary care. There was a total of 213 women presenting, and they were given a self-administered questionnaire of 59 items. And what I can tell you is that it looks to be any sexual trauma, and so it sounds like the questions were most likely relatively vague.

So out of those 213 women that were assessed, 78% reported ongoing pain problems, and then 36% reported any sexual trauma. The presence of sexual trauma was associated with higher levels of pain and higher levels of pain interference. So, if we look at the conclusions of some of this data, women with a history of sexual trauma have higher rates of pain symptoms such as pelvic pain, gastrointestinal disorders, headache, and back pain. Women will actually report again, more severe pain, more frequent pain, longer durations of pain, and more pain related disability. Ironically, enough within the military and the VA healthcare system, women are at risk for being undertreated due to the sheer history of military treatment facilities primarily being equipped to treat males. And again, I believe this is changing.

Another thing to note that I do like to emphasize here, correlation is not causation. I repeat, correlation is not causation, what do I mean by that? I'm very aware that many providers particularly providers an OB/GYN, or neurology, or primary care, may have had a plethora of cases where they are able to learn that the patients who present with pelvic floor pain, gastrointestinal pain must of had a history of sexual abuse or trauma, and I'm here to tell you that is always not the case. We cannot necessarily assume we must be thorough in how we approach and discuss things with our patients. This can become very challenging because, as somebody who also has specialized in trauma, it is very difficult, it is not common for people to not disclose the most poignant abuses. A person who had survived more than one trauma is more likely to endorse a lower provocative event before they speak or admit to a primary most disturbing event. So, it may very well be underreported. Nevertheless, a provider's ability to assess their early history must be taken into consideration if a patient presents with certain pain related conditions that may not necessarily be because they were sexually traumatized, we have to be thorough and rule out other potential

complications, endometriosis for example or, delivery and pregnancy related concerns just as an example.

All right. Additional factors that are associated with feminine, or feminine reports of pain as I was suggesting, pre-, peri, or post-menopausal pain can be very disabling. Fibroids. And, like I said, endometriosis, pregnancy and post operative pain related complications such as scarring or trauma. So, again, I think I have to emphasize a multidisciplinary approach in cases like this, you may be one of the more appropriate ways to collaborate and ensure the patient is cared for, and that the history of the patient is addressed and impactful in a careful way.

Talk about pelvic pain. Over 60% of women have more than one cause for pelvic pain. Yes. Of course, we must rule out sexual trauma, which is common, it may also explain male pelvic pain. Other common ideologies for pelvic pain are the following conditions. Which, in some cases applies to both sexes. Okay. So, in general most pain a returning OEF/ OIF veterans is musculoskeletal. So, I have a number of interesting studies collected by the joint commission for the study of pain. If you look at the graphs here, what you can see is an observational study of 163,812 returning OEF/OIF veterans enrolled in the VA and had at least one visit within one year of their last deployment. It was a longitudinal study and what you can see, are the breakdown of the types of pain related complaints.

Over 50% of the injuries were musculoskeletal, psychiatric disorders, 23%, and the breakdown of psychiatric presentation of, how do I say this, basically noncombat related injuries by gender were not available here.

So, they are using an abbreviation I want to have clear. Standby one moment. Yet, these are non-battle -related injuries is what we are looking at here. So, disease and non-battle-related injuries has resulted in significantly more hospitalization, and time loss than actual battle injuries as a result of the combat environment.

There seem to be higher rates of this in female soldiers. It accounted for 7.9% of the population, and 12.5% of non-battle related injuries. 74% of all female non-battle related injuries medevac for pregnancy related issues. Musculoskeletal injuries were most common, no gender related significant difference existed for soldiers receiving medevacs for musculoskeletal disorders. This was a study conducted by the U.S. Army Brigade combat team during OIF.

Another unique study that I have reviewed here, was the prevalence and age-related characteristics of pain, and a sample of women veterans receiving primary care. So, out of 213 women receiving primary care, 78% report ongoing pain problems, and the mean duration of the pain was an average of six years, and average pain that they were in the range was about 2.3 hours. Commonly endorsed women pained of lower extremity, low back, and shoulders. The highest prevalence of age range from age 36 to 60.

And then lastly another detailed study that was looking at quality of life in VA patients with mental illness, looked at over 18,000 veterans and noted that female veterans with serious mental illness had lower scores on the SS 36 physical component summary. Okay, so this is the self-reported form that often looks at overall physical and psychological well-being so, in the subcategory of physical sign and wellness, that lower scores indicated that had worse symptoms and they were more likely to report that they were limited in a lot of activities of daily living. They reported more pain than the males.

Okay. Additionally, women's pain is more likely to worsen with time, so if we look at this data here, the women veteran's cohort study examines the prevalence of painful musculoskeletal conditions in male and female veterans, and the trajectory of these conditions over seven-year periods. After they return from deployment. This is an observational study. The study population was taken from the VA OBS and OIF roster, and it contained information primarily about U.S. personnel who were discharged between September 2001, and September 2009. So, there was a total of 450,000 people. So, if you look at the stats, by year seven, it looks as though both male and female reported higher levels over time, but the female population tended to speed and worsen more quickly and intensely than the male population.

Okay. So, since we already took our break, we are going to skip through this. Because to me this is where it starts to get fun. And interesting [Laughter] okay?

So, we're going to talk about sex specific fact is that we believe are happening here. And although, we notice that in female military populations, there seem to be higher reports of pain related musculoskeletal injuries and conditions, we must also take into consideration, how valuable this sector of our military population has been particularly in country where the only way many of our troops could get past certain lines and be able to search, protect, and acquire safety would be if it was a woman to woman pat down.

There was no way we could have male troops conduct those that show respect to our members of the certain parts of the world, right? Okay. So, there have been some interesting gender differences that are apparent in the brain that have been analyzed through imaging studies using positron emission or pet types of interest imaging. And what these data show, that effective emotional response to pain, meaning dominated more by the singular [Indiscernible] in females, and that part of the brain is more specialized in the areas of concentration, focus, emotion formation, and processing. Learning, and memory. Again, this is the cingulate circuit in females. We believe that there may be a higher level of activation dominated more in this area for women than for men. More to follow.

So this may be a hard slide to view, and I apologize if you can get the print out, or if you can have it in your handout, the primary reason why I put the slide up is because many people assume that when we experience pain it may only go to a couple of places, and by the sheer look of this zigzag ping-pong experience of the brain, you can see that a typical

processing experience, of what we would call a neural chat, how pain is processed in the brain, processed by receiving afferent information, relaying that information to other centers of the brain, have I been before? What happened then? What am I going to do about this? Is it bad? Is it good? Am I going to live? Am I going to die? It bounces off so many areas, you can have a good idea that there are at least nine different areas that are bouncing around when we experience pain.

Those areas include but are not limited to, the premotor frontal motor cortex, the cingulate which is on concentration and focus, problem solving, and memory. We have the amygdala, for fear, fear conditioning and addiction. Of course, the sensory cortex, we have the hypothalamus, and the thalamus stress responses, motivation, and the cerebellum. Balance, movement, how am I coordinating my movement? The hippocampus where I'm filing this away in my memory, and then the spinal cord, what's happening from the periphery?

The studies that were looking at differences in brain activation between the sexes and in response to pain, came up with certain conclusions and theories based on the relative functions of each of these regions. So, keeping in mind, structures that activate in the brain, regardless of your gender or sex, the primary motor he senses cortices, the cingulate gyrus, the lenticular or amygdala, and the cerebellum are normally triggered, doesn't matter what your sex is. However, as pain transitions from acute to chronic, we start to see different brain regions play more or less active roles which is consistent with prior literature suggesting that as pain persists, the areas of the brain that are activated start to transition more away from the sensory cortex and into more into unique areas involved with the prefrontal cortex, decision-making, and anticipation, behavioral activation, so we know that as pain persists, the brain regions that start to play a more or less role in activating are those more involved in cognition mood and injury. [Captioners transitioning]

So, when a sensory experience becomes paired with a visually and perceived as real or potential threat the experience becomes paired with context as we know physical movement and sensation. This is where things can become unique based on the circumstances of the environment and they injury that has occurred. In regard to the sex differences, both sexes use the same areas but don't necessarily spend equal time in these areas as pain persists. So, in those areas of the brain that were mapped by pet scans what we have been able to find is that there seems to be greater activation of the right side of the thalamus and interior insula female. There is some evidence to suggest that the insula in the right side of the brain in general are more responsible for social involvement, emotional processing and experiencing, and prosocial engagement. It may explain why we tend to see women present and communicate and respond more effectively to emotion focused therapies, why we tend to see them seek more social support and outward connection to other people. We also see greater activation of the right prefrontal cortex in females. We see greater activation of the primary sensory motor cortices in males. What does that suggest? It may also explain why we tend to see again, pattern wise, male patients engage in more distracting activities. Physical distractions to cope with pain in a more physical way. We see greater

activation of the right parietal cortex in male, greater activation of the left prefrontal activation in males which we know is more responsible for language, analytical processing and things like that, greater activation of left prefrontal cortices in male. So, for those of you who are schooled on neurobiology I'm opening the room for comments, curiosities, questions. Anybody?

To try and summarize what we believe this is showing us is that regions more activated in males implied that sensory processing dominate more so compared to female patients. We see that in terms of the areas that light up in the parietal, primary and secondary sensory cortices. Whereas the regions were activated in females seem to imply more effective processing dominance compared to male. When we see this noted in the right cingulate these regions have received more substantial and direct input from the amygdala and the hypothalamus. It may absolutely explain what we tend to see in stereotype but if there is a biological foundation that we actually truly explain the differences in presentations, and it does not necessarily mean one sex is weaker or less capable per se of working through their recovery then another.

Once again, these are general trends and both brains of both sexes use the same areas for pain but don't necessarily spend the same or equal time in these areas of the brain.

Pausing for questions on that or thoughts or comments.

All right. Here is something that I find fascinating as well and this might come to some of the questions we have. Hormones are complicated. I think we have another hot microphone out there. If somebody can make sure they microphone is muted, that would be ideal.

Let's start talking about estrogen. I know several of you were aware that estrogen plays a role and one of my colleagues actually who was a pain specialist when she was studying for her board exam, she just said I know that estrogen is not deceptive. If your study for your exam that's one way to keep this in mind, there's something about estrogen that is involved in the pain experience and what we suspect is happening is summarized here. We know estrogen levels affect serotonin and dopamine. We also know that serotonin and dopamine are strongly involved in mood. Right? Estrogen also plays a protective role in cartilage and bone degradation. Which can affect the onset and experience of pain. On the one hand even though estrogen can be very protective, when our female patients are undergoing menopause, we recognize that significant drop in estrogen now places them at greater risk for potential osteoarthritis and bone degradation, fractures et cetera. We know that estrogens will drive the inflammatory process up and may contribute to a higher risk for autoimmune diseases. That may be why we see women have higher rates of rheumatoid arthritis, osteoarthritis and systemic lupus. There is some connection between estrogen and inflammation and how the body responds with the inflammatory process based on what's happening in the environment.

Studying the transgender individuals undergoing hormone treatments note that greater prevalence of chronic pain in male to female patients

undergoing estrogen and anti-androgen treatments than female to male. So again, within groups it is a fascinating observation that we have been learning when we are studying transgender individuals. The simple awareness that the application of this hormone is altering somebody's subjective experience is pretty significant. There have been some interesting further studies Lee and Ho in 2013 that suggested that estrogen may cause opiate receptors to come together and alter opioid analgesic effects and that may impact why women may be at greater risk for substance use of opioid. Again, a lecture by Dr. Vanderoff at the University of Arizona, he gave a lot of this general information so if you are curious and would like to look at more, Todd Vanderoff the department of pharmacology and professor of anesthesiology at University of Arizona, Tucson gave this lecture.

Interestingly enough, before I carry on with the testosterone, I want to highlight this female gender or estrogen status may be a risk factor in the ideology of TMJ pain as well. Pain in the joint region often occurs with no overt signs of injury or inflammation although the ideology of this pain may involve multiple factors and one likely risk is that it may have to do with estrogen status. There is some interesting new literature coming out that we are not certain about but a new model that was termed the TMJ pain matrix is proposed as pretty critical integration of sensory signals in the lower brain is modified by estrogen the status and loosely linked to endogenous pain and autonomic. Did we lose you?

Yes. For some reason I got disconnected. Hopefully everybody can hear me. I'm back. Let's get into testosterone. What is happening here? What role does testosterone play? Chronic stress or pain causes significant decreases in reproductive hormone from the adrenal gland. If we think about the impact of chronic stress or chronic pain, we know that it can actually decrease the production of important hormones and maybe some even have actually seen this in some of your patients who have had chronic pain particularly in your male population you may have low testosterone counts. So, by a show of hands, how many of you have been treating or are aware of your male patients who have low levels and need hormone therapy with testosterone? This is interesting because we often categorize stress independent from pain and yet, if we think about the way the brain is processing information, pain is stress. The brain has only two ways to respond to environmental cues. One is through the sympathetic nervous system and the fight or flight or freeze and the other is a relaxation response. So pain as I mentioned earlier in my talk is perceived as a life or death survival unlike our other senses and as it is coming in through the system there is a reason why it's noxious and not fun and it is to alert our higher symptoms or the higher orders of the brain. To figure out whether or not this is safe or not safe is this going to damage me or not damage me and am I going to live or die in if we are under persistent or chronic pain, we have to look at the long-standing impact pain will have on the HPA axis. That's why we may be seeing a lower productivity level.

We know that low levels of testosterone are linked to high risk for an inflamed nociceptive nervous system. And consequential chronic pain conditions in the male patients. This may explain why we are seeing more patients cases of fibromyalgia in our male patients and why we may also

experience what we call central sensitization. Essentially if a metabolically and if we don't do thorough blood work, we may be overlooking significant differences in our patients that could actually be addressed and treated appropriately. We know that depletion of testosterone is associated with key symptoms of hyper myalgia, chronic fatigue, muscle wasting, or muscle dysfunction and a lower threshold for pain. Keep that in mind when you are assessing your male patients. Fatigue is one of those strange things that is a symptom that can represent many different diagnostic issues. Thank you. I know there has been a delay. But although fatigue may represent depression and although fatigue may represent low levels of testosterone and although fatigue may represent poor sleep the important thing to note is this is a multidimensional presentation, all the more reason why we need to take a biopsychosocial approach, all the more reason why we need a multidisciplinary approach so we can try to top all areas. I like to think of the diamond in the rough so all edges of this diamond and make sure we can fine-tune and polish all of them.

So, what we have learned is the appropriate levels of testosterone have been found to be protective against the risk for developing pain and we see this more and animal studies, but we are starting to gather more information. There was also an interesting study looking at using testosterone to treat TMJ pain in animals. Even maybe some efforts to look at using testosterone to treat post vasectomy pain. I don't have the results on that yet. They seem to be promising. It will be interesting to see what happens. We also know that certain types of testosterone treatments have been used to treat certain types of cancers. So, moving along.

Taking a look at that. We are hopeful that the presidents have been found to protect against developing future pain as well. So, what is going on in the brain exactly. How do we explain that? So, we believe that receptor locations for estrogen versus receptor locations for testosterone are in different locations and hence, the sex differences in how the cells are receiving the transmission which can impact learning, memory and consolidation. If we think about what happens once our sexes bifurcate, there is a different production and allocation of where these parts of the brain are utilized and how they are utilized and where these hormones are actually being applied. What is really fascinating is that there is some cutting-edge research looking at what happens when we are placing estrogen directly on the hippocampus involved in memory consolidation and emotional consolidation. What we have been able to discover is that when estrogen is applied directly to these cells, there appears to be budding of dendritic growth within 24 hours. This suggests that estrogen may impact the growth and activity in the central nervous system at the dendritic level and may facilitate learning. If we apply that information to what we see in the room and what we may be looking at particularly within the female population is the impact estrogen has on planting long-term risk factors for chronic or persistent pain because of the effect on learning and memory. And the processing of the nociceptive information. Interestingly enough this does not happen with androgen.

Nero immunity in and pain. Immune system cells modulate the transition to and the maintenance of chronic pain. We know that estrogen is involved in

the stimulation of the pro-inflammatory response. Women are predisposed to greater pro-inflammatory TH1 cell action. So, estrogen and androgen receptors are located in different types and result in different functional outcomes. Estrogen maybe stimulating more of the macrophages involved in the pro-inflammatory pathways.

Androgens however maybe activating more of the anti-inflammatory responses systemically in the central nervous system. Again, highlighting some takeaways. Women tend to have greater pro-inflammatory system. Women with high levels of estrogen and low levels of testosterone may be predisposed to greater pro-inflammatory TH1 cells and androgen maybe activating more anti-inflammatory responses systemically in the central nervous system. Males with increased levels of testosterone suppress the activities of the CD for IT cells involved in anti-inflammatory pathways and again, this information why are we talking about this? It may help explain the transition from acute to chronic pain conditions that differentiate between the sexes. I want to pause here and ask the room if anyone has any additional information to contribute and if you are a lover of endocrinology or if you have any additional questions or thoughts, I am open for commentary. I find this subject matter it is new and we're still trying to unpack a lot of this and some of the basic science is still being conducted to learn more about the differences in these two hormones.

All right. Radio silence. Wake up everybody. Wake up. Moving along I want to highlight this interesting chart. It is one way that we can actually maybe consider if you will, how to conceptualize or at least start the process or conceptualize a treatment plan based on what walks in the room. One way we can categorize without over proselytizing is to at least identify what we know the research is telling us. If we look at the top symbol here that's the male versus the bottom symbol that's the female, we may want to pay attention to those factors that can definitely explain why certain patients present in a certain way. Let's start at the bottom with the female symbol. Some of these sex specific factors that may be influencing outcome from the transition to acute to chronic pain. If the injury is essentially the same, based on the red indicator, we have to take a closer look and recognize that in the male brain, the male brain may be more primed to engage in behavioral activation, threat control, psychological fear yet physical activity. We also know there is a role of the [Inaudible] and the androgens the baby playing a protective factor. Now we cannot look at this without taking into consideration outside influences of the environment, right? What is my gender role? What is my assignment? How will I be perceived if after complaining? How am I supposed to execute the mission? We have to take that into consideration and that will absolutely influence my pain expression. If I am female, I have to recognize that some of the biological intrinsic factors may be influencing her situation. She may be spending a lot of time swimming in the mental and emotional rumination, maybe more than a typical male word. She is also having a lot of T cell and B cell activation. She may be looking for some functional relating connecting but we also have to take into consideration the environment and the culture that she is operating in, what type of outside influences may be impacting her ability to express her pain effectively. Has she been dismissed? Has she been minimized which is quite common, are there

certain attributes and stereotypes being appointed? Does she have social support? So, this is a neat way of thinking about these two sex differences uniquely, but it will also explain all the more reasons why it is so important to make sure that when you do speak your patient have a very explicit and clear understanding of how he or she or they identify. Are they in transition or not? Whether or not they are in transition, whether or not they're taking hormone replacement therapy, whether they are male, female, somewhere in transition is going to help you better understand the role that hormones may be playing. Is this person in menopause or not? Does this person have low levels of testosterone or not? These are things that may determine how you want to treat your patient.

All right. As we bring this and wind is down, I have a few summarizing concepts here. The biopsychosocial differences between sexes warrant different interpretations and unique treatment plans. Differences in mental health comorbidities may play an important role in pain care decisions that we make. History, gender role identification, stress, prior pain experiences all influence the pain experience and ultimate transition from acute to chronic pain. Hormonal changes likely increase the risk of musculoskeletal pain and place women at greater risk of obtaining inflammatory related pain conditions. Women are more likely to also have increased stress related family responsibilities based on the data collection that we understand, there does still seem to be an imbalance between responsibility allocated to women compared to men in heterosexual relationships. Sex specific differences in pain and central nervous system processing implied the treatment methods used may yield their outcomes if we adjusted our treatment to fit the sex of the patient. Let's keep that in mind. Different sexes may benefit from different treatment approaches based on biopsychosocial differences. So, what can we do? We recognize that in the military medical population in particular women desire more personalized, connected social support and care. This is not only based on cultural phenomenon. We can now tie to biological and physiological activity in the anatomy of the female body. They want to be taken seriously, they want to be reassured. Perhaps providers can aim to understand the different biopsychosocial needs of women throughout the lifecycle. Let us take into consideration the risk factors associated with being young versus being older. To be old enough to have children and if there approaching menopause, we have to understand the differences in what is going to happen anatomically and physiologically throughout the lifespan. We also need to understand that the psychosocial needs of women may be different than their male counterparts. Again, distractibility, functionality, behavior versus social connectedness, emotional processing, meaning making. Hormonal changes can play a role in pain intensity and the treatment options and may increase the risk of musculoskeletal pain.

We know that there are increased risk factors connected to insomnia across the board. For every patient of ours, particularly in the military population, we have seen this time and time again. Over 70%, I think some people may say close to 80% of all military patients that come to our pain center qualify for having a sleep disorder or primary insomnia and we now know interestingly enough that if an individual is able to get into the deeper stages of recuperative sleep, the brain has a natural

filtration system we believe rinses, channels and funnels out the toxins produced throughout the day from all of the activity that has occurred during wakeful hours. If the brain is not allowed to access those deeper stages, then the cleansing and the filtration does not occur. Pain can interfere in that process regardless of sex, gender or identity. If we can address that in a multidisciplinary approach this may also do wonders in helping out to patients reducing the inflammatory response and help them on the path to recovery.

We have to be aware of the increased risks of comorbidities and mental illness, depression in particular, and risks for suicide are higher among folks who have chronic, persistent pain and as I mentioned earlier, although women may tend to engage in more behavioral suicidal gestures or acts, males are more successful at completing a suicide. In either case we need to be mindful of comorbidities as pain and psychiatric illness. Female specific medical comorbidities unique to this sex should also be examined thoroughly. We must take into consideration the unique aspects of the female anatomy that we may be overlooking if in fact we have not done a thorough check that could complicate our treatment options. All of this information really supports the need for interdisciplinary or multidisciplinary care and a group treatment approach.

So, this said as you move forward with your patient care always consider the risk of sexual trauma regardless of identity. We cannot assume that this is only a topic for our female identified patients. Perry menstrual pain syndrome may worsen headaches, back, and pelvic pain as well as change emotional response to pain. We may be able to do preventative work with the consent and educated knowledge to give to our patients, we may be able to moderate modulate that process. Preconception counseling is important when considering the use of pain medication and birth control and if we have women that will be deploying or going overseas. During pregnancy hormonal changes may increase pain and related stress and perimenopausal women have an increased risk for insomnia, depression, and stress. Menopause and changes in weight may predispose to worsening arthritis and aging. Education is key. If there is one area that may be very helpful for our providers as our female veterans continue to age, the information associated with hormone replacement therapy is crucial across the board, whether it be for testosterone as well as estrogen replacement therapy. If we have patients that are struggling with fatigue, we have to make sure that we are looking at a thorough thyroid panel and thorough blood panel making sure that our biology is equally attended to as well as our psychology.

I have here a list of some interesting considerations for future research around approved treatments. One of the things I think is kind of on the cutting edge is the difference between hormones and chromosomal contributions to sex differences. How might these two potentially influence differences in pain presentation across sex. We are doing so much with genomics these days. This may be a new direction. We are very curious about the contributions of local versus peripheral hormone effects in the system. Is there a delayed response? Do we know the difference between what's happening in the central nervous system versus the periphery? I think we need to do more of that. We may need to clarify the psychological factors and how much they influence the magnification

and/or minimization of pain and to study the behavioral differences and rehabilitation between men and women it will be valuable. The extent to which pain contributes to sex differences and maybe even clarifying the roles of sexual dimorphism in ascending versus descending pathways. Now would be a fascinating time to do more studies on transgendered and sexual dimorphism in our patients. Cellular and molecular basis of sex differences in pain and analgesia. We have to get maybe get down to even a lower level, basic science. Sex differences across the lifespan. Whether or not the diagnostic criteria for some pain disorders should be sex specific. On that note, I'm at a point where I can actually wrap up or take questions for an open dialogue or Q&A.

I see some people typing. By all means, if you're comfortable showing your face, that would be wonderful some of the only one showing my face.

We have at least one person typing in the questions so there may be a delay. Okay. I saw a case where we had a male wanted to transition at the age of 63 and was put on estrogen. Estrogen would not be initiated on a female of that age so what you think of this? That's a really fantastic question. It is my understanding as a clinical psychologist that part of the ability for an individual to transition is going to be based on the individuals understanding of their dysphoria, their gender dysphoria and what would an angle to be to safely transition into the proper identity. When it comes to the effects of hormones, and I would love to invite other members of the audience to contribute to this, we have to take into consideration the other effects of estrogen has been known to do. For example, there may be alterations in breast development, softening skin tone and the growth of hair minimizing in certain cases such as that and part of the process as far as I understand when an individual is going to transition is the ability to do what is necessary in the process to make the transition in order to acquire the features of that sex to be most fitting as appropriate. Nevertheless, there are some risk factors of continuing estrogen and hormone replacement therapy so, it's a fantastic question that I would reckon somebody who is in and chronologist may be better apt to answer. Again, coming from the clinical psychologist perspective, one can engage in surgical transition however, there are certain things that surgery cannot provide that hormones can in terms of features and secondary sex characteristics that may be part of that person's acceptance of their transition. I hope that answers to the best of my ability but by all means, I would love for others to contribute if they have any thoughts on that. You're welcome. Good question. Any other questions?

I do have some closing thoughts that might tie this in while we are waiting for the questions. In general women tend to seek help more often than men. I think that ties to the biology in many ways. And even though they seek the care more often as a result they may face greater challenges in this military culture of course of stigmatization, misunderstanding and gender bias. We know that to be the case. Apparently given the data communication and social needs of women are important to address at every visit. We also have to take into consideration regardless of sex it will be very important for us to assess in anywhere patients the psychosocial climate of home and the responsibilities to children and the needs associated with their children or because you have

such an internationally diverse military population if our patient also a network of elders has aging parents or spouses in need of care while they themselves are undergoing care.

Any other thoughts or questions before we wrap up today.

It is so quiet. I do see someone typing. Okay. Thank you. Thank you, Jennifer. Thank you, Jessica. Thank you. Thank you so much for dialing in. Elizabeth, thank you very much. I hope you found this valuable. Absolutely. I want to expand my thank you to all of our providers out there both male and female and everybody in transitioning between. Thank you so much and there should be a reference at the backside of my slide if you're curious about reading one more information on that.

There is a question if you're comfortable sharing your email for follow-up questions. Absolutely. I put it in the chat box. I'm entering it right now. Kathleen.a.mcchesney.civ@mail.mil. And by all means once you have a chance to look at the literature or you need any references, I would be happy to do the best I can to get you the information. Thank you everybody. Good luck and enjoy and stay safe.

[Event concluded]