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Session: Military Risk Factors and Risk of Dementia in Female Veterans

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Moderator: It’s a pleasure today to have Carrie Peltz speak with us about the military risk factors and dementia in female Veterans. Carrie is a Cognitive Neuroscientist trained in Missouri, now working with Dr. Kristine Yaffe in studying brain injury and dementia in San Francisco. So with that, we welcome Carrie.

Dr. Carrie Peltz: Great, thank you so much. So today I’ll be talking about military risk factors and dementia in female Veterans. And I’m excited, this is an important topic so I’m excited to give you a little view into our work. Let’s see. Oops, there, okay. So I wanted to do a question first, just to sort of see who’s listening in, about whose role and what kind of roles people have at the VA.

Rob: Carrie, I have that poll up and running and your audience members are\_

Dr. Carrie Peltz: Great.

Rob: \_making their choices now. Question being, what is your primary role in VA, answer options being student, trainee or fellow, clinician, researcher, administrator or other. We have about 65% voted now, and things do level off around 75%, so I’m going to give people a few more moments to make their choices and then I’ll close the poll. Things have leveled off, so I’m going to go ahead and close the poll, and I’ll tell you Dr. Peltz that 8% say they’re student, trainee or fellow, 31% clinician, 31% researcher, 4% administrator, and 27% other. Would you like to launch right into\_

Dr. Carrie Peltz: Okay, perfect.

Rob: \_the second poll?

Dr. Carrie Peltz: Yes, that would be great.

Rob: Okay, that poll is up.

Dr. Carrie Peltz: All right, so this, great.

Rob: Go ahead.

Dr. Carrie Peltz: Yes, so I was just wondering how familiar people were with research involving big datasets or epidemiology, which will sort of help me as I’m explaining some of my graphs and things. So if you’re very familiar, somewhat, or not at all familiar.

Rob: People are rapidly making their choices on this one. We’re up around 70% already. So again, we’ll just give people a few more moments to make their choices. And we got a bump, and things have seemed to level off, so I’m going to go ahead and close the poll and share out results. And Dr. Peltz, 16% say that they’re very familiar, 58% say they are somewhat familiar, and 26% say that they’re not familiar at all. And now we’re back on your slides.

Dr. Carrie Peltz: Okay, great, thank you. Okay, great, thank you. Very, very helpful. Okay, so let me move on. So I just wanted to give a little bit of an overview of just women Veterans in general, and how that is a really growing population. There are currently over two million women Veterans in the United States. Nine percent of all Veterans are women, and of those, 30% are 55 and older. So these are women that were in the military presumably quite a while ago and are now receiving care in the VA. And due to this, the number of women using the VA have nearly doubled in the past decade. And so this is related to what we’re going to talk about later on, nearly half of these women Veteran patients have some sort of a mental health condition.

And just to give you sort of a break down of men and women Veterans that are by sort of the period of service, which is a variable in the VA datasets that we have. You can see that obviously not too many women from World War II or Korea are currently alive, first of all, and also Veterans. But you can see that number increases as you get into the more recent conflicts, particularly the second Gulf conflict, and of course peacetime as well. You can see the women in red and the men in blue.

So there has been a fair amount of work in dementia in Veterans overall, and I’m going to go over that in a little more detail later on, but in general, we know that lifestyle and health-related factors can increase the risk of dementia. And that military service leads to increased rates of specific risk factors, such as post-traumatic stress disorder and traumatic brain injury. But there are other risk factors that are also elevated in Veterans such as [unintelligible 4:55] smoking and sleep problems. However, very few studies have focused on dementia in women Veterans and what risk factors they may experience.

So the first study I’m going to talk about from our group, we really just wanted to see what the prevalence of cognitive impairment was in this population. And so by prevalence, I just mean the percent of people who even have impairment within a certain time period. And then also what psychiatric and medical conditions are associated with that cognitive impairment.

So what we did was take all female Veterans who were 65 and older who received care at the VA between 2005 and 2015 and put them in a big dataset. So basically the VA has a large electronic medical record, as probably most of you are familiar with, but you can use that data to do research, and all of the diagnoses that people are given every time they come in for a visit is all recorded. So doing that we ended up with over a hundred and sixty-eight thousand female Veterans who are within this age category who went to the VA between this 10-year period. And so all we did was to look and see what percentage had a cognitive impairment diagnoses, and we broke this into two different types of diagnosis. The first being mild cognitive impairment, and in order to define that, we used ICD-9 codes, which healthcare providers put in the record every time a person comes in for a visit. So we could see how many people have those codes. Mild cognitive impairment is a cognitive impairment, obviously, but that is milder than dementia, so usually people don’t have any problems in their normal day to day life, but they have noticed some sort of decline. And then we also look at dementia, which we also defined by ICD-9 codes, but also we included people who were on dementia medications who maybe didn’t have that code but were on the medications, because the medications are not used for any other purpose other than dementia, so that helps broaden it a little bit more. And so people who have dementia have cognitive impairment, but they have it severe enough to impact their daily life. We also looked at medical and psychiatric conditions that might be associated with the cognitive impairment, also defined by these ICD-9 codes, and for these conditions they had to have the diagnosis more than two years before they received the diagnosis of impairment, or for the people without impairment more than two years before their last medical encounter.

So overall, we found that 10% of female Veterans within this 10-year period had cognitive impairment, 2% of them with mild cognitive impairment, and 8% with dementia. And so you can see in this figure we show overall the different age groups. So you can see that in the 65 to 74 group, for example, that less than 5% of people had some, of these women had impairment, whereas if you get to the older age group, over 85+, over 20% had some sort of impairment.

For the people who had a dementia diagnosis, 37% of them had a subtype listed. So dementia is just sort of a general term, and there are different types of dementia that can be diagnosed clinically. So of those, Alzheimer’s was the most common with about 73% having Alzheimer’s disease. About 24% had Vascular dementia, which is a dementia that you can get from strokes or other cardiovascular problems, and then there’s some less common forms of dementia that were diagnosed as well, such as frontotemporal dementia, Lewy body dementia, and some others.

And finally, we looked at the comorbidities, medical comorbidities that might be related to cognitive impairment. So again, this is, these are diagnoses that people had two years prior to their cognitive impairment diagnoses. And so you can see, let me move my cursor over here, you can see here is the list of ones that we looked at, and the peach bars are the people with cognitive impairment, and the blue are people without cognitive impairment. And you can see that all are higher in people with cognitive impairment more than two years before they got that impairment diagnosis. And the first five listed here, hypertension, pain, arthritis, diabetes, pulmonary disease, and TIA and stroke were quite a bit higher in people with impairment versus without. And overall, the prevalence of having one medical comorbidity was twice as high for Veterans with impairment compared to those without.

We also looked at psychiatric conditions in the same way and found a similar pattern, although it was even more striking how those people with cognitive impairment had higher rates, once again, before they received their impairment diagnoses. So depression, anxiety, psychotic disorders, and tobacco abuse was much higher in people with impairment compared to those without. Overall the prevalence of having one psychiatric comorbidity was three times higher for Veterans with impairment compared to those without.

So in conclusion, this study was one of the first to report the prevalence of cognitive impairment in older female Veterans. We found that the prevalence of mild cognitive impairment was only 1% at age 65, but it increased to 3% by age 85 and older, over. However, dementia was higher at 3% at age 65, increasing to more than 18% at 85 and older. And we found that older women with cognitive impairment have twice and many medical and three times as many psychiatric conditions compared to women without cognitive impairment.

So putting this into perspective a little bit, the rates that we found as mild cognitive impairment and dementia in women Veterans in this study were similar or slightly lower than population-based studies of non-Veteran women. So other studies have found similar rates. So these Veterans, they did have higher rates of dementia or impairment, however, in this study we were only looking at diagnoses based on what the doctors put in their medical records. So a lot of people, for example, with mild cognitive impairment may not actually ever get an official diagnosis of mild cognitive impairment in their medical record. So if anything, the rates are actually higher than this, but it doesn’t appear that rates in Veterans are higher than the general population. However, we did find that multiple conditions were associated with or perhaps contributed to cognitive impairment, and the Veterans have higher rates of these than non-Veterans. So things like some of the medical conditions, but particularly the psychiatric conditions, such as depression and post-traumatic stress disorder are more common in Veterans. And sort of the bright side of this is that many of these conditions are modifiable and possible areas for intervention. So better controlling cardiovascular risk factors, for example, could lower risks of dementia, and the same for mental health treatment.

So a little bit more specifically we were interested in these military risk factors and what effect they may have on dementia in women Veterans. So as I’ve spoken previously, Veterans have a unique constellation of risk factors, such as depression, PTSD and TBI. And as women’s roles in the military change, they may become more exposed to higher levels of these risk factors. However, there’s very little research on older female Veterans.

Just to give a little bit of background about the sex differences in these risk factors in general, and these are in the general population, women are diagnosed with depression two times as often as men. And in this figure here, you can see the females are in green, and males are in blue, and these are depression diagnoses across the lifespan. So you can see from the time that people are teenagers, through middle age, and then older age through all time periods, females have much higher rates of depression than men. And the same is true for post-traumatic stress disorder, so if you take both men and women who are exposed to a traumatic event the women are more than two times likely to develop PTSD compared to the men. On the converse, TBI is actually twice as prevalent in men than in women, but it’s so prevalent overall that nearly 10% of women will experience a TBI in their lifetime. And previous work from our group has shown that all of these military risk factors do increase dementia in male Veterans, and so I’m going to show you a little bit of that work just to give you an idea.

So this, so all the rest of the graphs I’m going to show are actually very similar to this one. So on this axis, this will be the incidents of dementia, so how many people developed dementia at each age, which is on the x-axis here. And then the different lines show the different groups of people. So in this particular study people were split into people who had a diagnosis of depression, people who had a diagnosis of dysthymia, which is a persistent depressive disorder that’s more long-term but a little bit less severe than major depression, and then people with this dash line who didn’t have either condition. And you can see that in general people who had depression or dysthymia are at a higher risk of getting dementia, which increases with age. And then people without depression or dysthymia. And at the very bottom, you can see that the increased risk of dementia in people with depression is 2.18, which means they have more than two times increased risk of dementia.

And so I’m going to show you the same graph here but in another group of mostly male Veterans. Both of these samples are about 95% male. And you can see that the people with PTSD were also at an increased risk of dementia, compared to people without PTSD, and about a 77% increased risk.

And the same was true for traumatic brain injury in a slightly different sample. Again, mostly male. And people with TBI had about a 60% increased risk of dementia over the lifespan compared to people without.

So what we wanted to do in our second study was to really determine whether these older female Veterans with military risk factors are also at an increased risk of developing dementia similar to the males.

So we again took all female Veterans in the VA who were 55 and older, and this time they had to have two visits between 2005 and 2015, which gave us our final sample of over a hundred and nine thousand women. And we have all their inpatient and outpatient medical encounters. We looked at depression, PTSD and TBI diagnoses, and these are all defined by ICD-9 codes, and they all occurred within a two-year baseline period.

And then during a follow-up period after, we looked at which people developed dementia, also defined by ICD-9 codes, and people who had dementia during the baseline were excluded from the analysis. We looked at various confounders and comorbidities to various demographic information that we can glean from the medical record, and then also medical disorders that were defined by these codes during the baseline period.

So this here shows the characteristics of these women at baseline, and I’m going to show you here, these are the groups that we split it into. So these are the group of women who don’t have any of the disorders that we’re interested in, people who had TBI only, depression only, PTSD only, and more than one of these risk factors. And so this way we could really split it up and sort of see what the influence was in each one of these diagnoses on the risk of dementia. Overall, these women were almost 70 years old, and you can see the sort of break down. It did differ significantly between groups, as did race and education, and all of the medical conditions were all significantly different between groups. However this, these are such large groups so that’s not too surprising, but if you look at the numbers you can see that there are some differences that may be significant.

So then we were able to look at the association between dementia and these various conditions in older women Veterans. And this first slide is showing traumatic brain injury and the risk of dementia, and for each of the ones I’m going to show three different models. The first model is suggested for age only, the second is age plus demographics, and the third is age, demographic plus comorbid conditions that we looked at, which are listed at the bottom of the slide. And you can see that in the fully adjusted model traumatic brain injury increased the risk of dementia about 50%.

If you look at depression you can see, again, the risk of dementia was increased in people with depression compared to those without, about 67% increased risk.

And then in PTSD, again, the risk was increased about 78%.

And then in people with more than one risk factor, the risk was higher than any individual factors singly, so they seemed to work together to increase the risk even more. So it was more than two times increased in people with more than one of these diagnoses.

And then here you can see them all placed together on one of those graphs, showing the incidence of dementia over the lifespan. And you can see the black line as people who didn’t have any diagnoses, and then you can see the sort of single diagnoses all clumped together in the middle, and then the red line is more than one risk factor, and that was the highest risk of dementia.

So to summarize these, we found that older women Veterans with traumatic brain injury, depression, or post-traumatic stress disorder had a 50 to 80% increase in the risk of dementia, compared to those without those diagnoses. [Cough] Excuse me. And having more than one military risk factor increased the risk of dementia more than two-fold. And this association persisted after adjustment for demographics and comorbidities. So we found similar findings after requiring some additional sort of limits on our data. So we wanted to make sure that people who, that the people who had these diagnosis really did have the diagnoses. So, we did another analysis where we required people to have two diagnoses of say TBI and depression and PTSD in order to be included in the analysis, and we found similar results with that. We did another analysis when we did a two-year lag, so between when they were diagnosed with, you know, PTSD, TBI or depression and when they got the dementia diagnosis, we required at least two years in between there. And again, we got the same results. And the final one was we were interested in whether the fact that these women who had these diagnoses they were likely seeing their doctors more often, they were coming in for more appointments and therefore they were actually having a higher chance of being diagnosed with dementia just due to the fact that they were being followed a little bit more closely. So we wanted to adjust for the number of medical visits per year per person. So we did that, and the people who had the diagnoses, TBI, depression or PTSD actually had twice as many medical visits per year as people without the diagnoses, so we were correct, they were coming in more often. And when we did the analysis with this adjustment we did find a similar result, but it was slightly attenuated, so that does show that some of the result was due to the fact that these women were being seen more, but they certainly still did have an increased risk of dementia.

So to conclude this study, we found that female Veterans were also vulnerable to the effects of military-related risk factors. And maybe that’s not exactly surprising, but no one had looked at it, and we were also interested if maybe they were more vulnerable to the effects and maybe the dementia risk was actually higher. And we found that it wasn’t, it was the same. Currently, about 2% of the women in our study had combat exposure. But the numbers are expected to increase with changing roles in the military. And as that increases presumably these risk factors will increase, which could increase dementia risk. So, in general, the implications of our study are that older women with TBI, depression, or PTSD particularly Veterans should be screened and monitored for dementia. And we hopefully will be looking at this in future studies. We now have this large database of older women Veterans, and we can examine other risk factors for dementia and other outcomes in this understudied population. And we currently have some abstracts out where we’ve looked at one set of studies looking at military sexual trauma in these older women Veterans and how that affects their risk of dementia and other aging outcomes, and then another study, or another abstract where we’ve looked at alcohol use disorder and how that affects the risk of dementia in older women.

Overall, the main take away is that there are some strategies to improve brain health in all Veterans and all people. And that’s just that treatment and screening of comorbidities, such as depression, PTSD, cardiovascular conditions, sleep problems, could help reduce the risk of dementia. So also encouraging people to increase or maintain healthy lifestyle behavior, such as stopping smoking, increasing physical activity, I know it sort of sounds tired, but you know, what’s good for the heart is good for the brain, and just increasing healthy lifestyle seems to be our best bet for reducing risk of dementia. And recent advances in dementia research really point toward multidomain prevention and intervention strategies. So, unfortunately, most of the drug trials very recently have not been helpful for Alzheimer’s or other types of dementia, however, studies that have proven effective are things that do more of what we already know is good. So things like tight control of hypertension and increasing physical activity, those seem to be currently the best ways we have of reducing risk of dementia.

So that’s all I have for today. I want to thank you for listening, and of course, we’re very grateful to the women Veterans who use the VA and make this study possible. And if anyone has any question or comments, I’m happy to answer.

Rob: Thank you, Dr. Peltz, we do have one question queued up, but audience members if you have questions please do submit them using that questions pane in the GoToWebinar dashboard. That white piece of software that popped up on your screen when you joined. I’ll just launch right into this question. In addition to mTBI, what are the other specific military risk factors? Might these be modified?

Dr. Carrie Peltz: I mean, obviously the ones we were talking about were depression and PTSD, but, you know, Veterans also do have other problems, like I mentioned sleep, they do have some higher rates of cardiovascular risk factors, drug and alcohol abuse, and yeah, there’s definitely some evidence that, you know, treatment or reducing these risk factors can help and may reduce the risk of dementia.

Rob: Thank you. This person writes, sorry if I missed this, but did you also have Medicare data that complemented the VA data when looking at diagnoses and risk factors?

Dr. Carrie Peltz: That is a good question, we did not for this study. This study was only using the VA data, but that is something we would like to do in the future. We haven’t really delved much into the world of getting into the Medicare data, but definitely, that is, it’s one possibility that these women are getting a lot of their care outside the VA as well, and combining those make it a better picture.

Rob: Great, thank you. Another question that just popped up, again, I may have missed this in the beginning, but did you do any analyses comparing severity of TBI and how it relates to risk of dementia?

Dr. Carrie Peltz: In this study, we did not in the women. Well, okay, I won’t say that, we did look at it, but in this study, the number of women with just TBI was relatively small, so we didn’t look at it too much. It did follow the expected pattern, but we have another study that we’ve done on a much larger group of both men and women combined, and we found that, you know, severity does increase the risk of dementia after TBI, but even mild TBI without loss of consciousness still increases the risk of dementia significantly.

Rob: Thank you. Were any of these diagnoses of MCI or dementia confirmed with neuropsychological testing?

Dr. Carrie Peltz: We weren’t able to do that in this study. They probably, you know, in some cases were. Most VA’s have a dementia clinic where they do neuropsych testing, but we just clearly, we just used the ICD-9 codes for, because there are so many it’s not easy to look into the details of individual diagnoses. But yeah, that would be a better way to do it, or it would be interesting to see if we got similar results. But generally, if people receive a dementia diagnosis in their medical record they are actually demented. It’s more likely that we missed cases of people who had dementia who didn’t get it in their medical record, so it probably actually works against us, but if we had more clinical markers of dementia we might be able to get some of those more subtle cases.

Rob: Thank you. And another person writes in, do we have data on sexual abuse? Is this a risk factor?

Dr. Carrie Peltz: So yeah, we do. So there’s a variable, the VA started collecting this data, I forget how many years ago, but started collecting specifically military sexual trauma in the VA. And every, I think every person, but certainly, every woman is asked, supposedly at every visit, and it’s put into the records. And so we did pull that variable and have been looking at it in these older women. It did not increase the risk of dementia, but it is associated with some other age-related outcomes and so we are, we have an abstract on that that’s been presented, and we currently have a paper under review with that information, so it should be out soon.

Rob: Thank you. How do these increased risk, I’m sorry, how do these increased risks due to TBI, PTSD, and depression compare to male Veterans?

Dr. Carrie Peltz: We were somewhat surprised, but that they’re very, very similar. The hazard ratios from our previous studies were nearly identical to the ones we’ve found in this study, so very similar.

Rob: [Unintelligible 30:18] Did you collect this data from the problem page of the CPRS or go over their history from earlier times?

Dr. Carrie Peltz: So these data were, I, you know, I’m not exactly sure, but I mean I know we get the data from both inpatient and outpatient visits, so I’m not sure where they actually get the diagnoses from. We have a person who does that, but yeah, I just know that these are diagnoses that they were given during visits.

Rob: Thank you. Have you ever thought of performing clinical review of random charts by any chance?

Dr. Carrie Peltz: Not exactly random charts, but we have talked about doing something more in-depth, sort of related to the question earlier about the neuropsychological testing, wondering if we could get at some of the other data that’s may be in the charts that’s not as easily used, but that will add a lot of depth. We’ve talked, there’s, you know, people doing things with natural language processing, so using computers to pull bits of language out of things like clinical notes, and then we might be able to use that to get at some slightly different questions like, you know, for example, my specialty is cognitive neuroscience, so I’m interested in more of the cognitive questions about, you know, do these people have memory impairments, versus impairment in, you know, executive function or something, and if we could find the people who had the extra testing, as the results of that testing might be in the notes.

Rob: Thank you. Is it possible to say that the exposures indicate females are more sensitive to dementia than males?

Dr. Carrie Peltz: I don’t think our results show that. In general, females do in the general population females do have higher rates of dementia than males, but that’s often accounted for the fact that they live longer, and age is the largest risk factor for dementia, but our results actually show that it’s pretty similar in both males and female Veterans.

Rob: Thank you, Dr. Peltz. At this time that is the final question that we had in the queue, well, oh, another one popped up. I’ll ask it now. The dementia, PTSD dyad seems very complex. How do you differentiate between cognitive problems due to PTSD versus dementia?

Dr. Carrie Peltz: Yeah, that’s tricky. And really, I mean the same could be true for depression or a lot of other conditions. I mean we tried to account for it in the data by having the lag and having the, you know, having the PTSD diagnosis more than two years before the dementia diagnosis. So hopefully the two wouldn’t be confounded, but that’s always an issue when you’re looking at conditions that might have similar symptoms, but we did try to account for that, and the relationship persisted even after that lag was instituted.

Rob: Thank you. I have one more question briefly, somebody asked, can we briefly consider treatment options?

Dr. Carrie Peltz: Yeah, I mean that certainly isn’t my area of expertise, but there are, there’s evidence to show that treatment of, for example, depression, and like I mentioned, really tight control of hypertension has been shown to decrease the risk of dementia. So there’s the beginnings of evidence that treating these conditions could help reduce the risk of dementia, and that at this time is probably our best bet at preventing dementia. There really aren’t a lot of treatments out there that work very well. You know, the medications, as I mentioned, we added the medications to our sort of definition of dementia, though the medications really are only helpful in some people and only to a limited extent. So really preventing dementia is a much better option, once the damage has been done to the brain I feel that it’s unlikely that much is going to be able to be done, but if we can get people into treatment for these risk factors, and reducing their risk in the first place, I think that’s probably the best hope.

Rob: Thank you. The questions do continue to come in one at a time. Was there a difference in progression to dementia from mild versus moderate and severe TBI?

Dr. Carrie Peltz: Yes, so there, we didn’t look at it in this study. We didn’t have enough women who had TBI to look at it very well in this study. But we have another study that we’ve published looking at both male and female Veterans, and yeah, the risk does increase with severity. Although even mild TBI without loss of consciousness increases risk of dementia.

Rob: Thank you. At this time that was the last question pending. I’d like to give you an opportunity, Carrie, to make closing comments and perhaps other questions will come in while you do so.

Dr. Carrie Peltz: Okay, well I just want to thank the group for having me here. I really appreciated the opportunity to share our findings, and we’re excited to sort of delve into this world of women Veterans that hasn’t really been explored much. And I feel it’s good to really try to understand that in the context of more women Veterans that are going to be coming into the VA. And then we can understand what their risk factors are for dementia and other factors in general. And that we can hopefully be more prepared to treat them and screen them.

Rob: Thank you. And as suspected, a couple more questions did come in. First being, is military service per se a risk factor?

Dr. Carrie Peltz: That’s interesting. I mean it is in that it increases the likelihood of having one of these other risk factors. So, people who are in military service are more likely to have PTSD or a TBI than people not in military service.

Rob: Okay, can/have you accounted for risk conditions with and without treatment? Presumably many of these cases of depression, for example, are well treated but diagnoses will persist in CPRS.

Dr. Carrie Peltz: Yes, that’s an interesting question. In this study we did not, we just looked purely at diagnoses. Although theoretically, the data is all there about who was treated, it’s just in a little bit more complicated form, and that is something that we talked about looking at in the future, say looking at, you know, people who are in regular therapy versus people who are on medication. So yeah, that would be something that would be really interesting to do in the future but that we have not done so far.

Rob: Thank you. They continue to come in. You indicated that treatment options for dementia become very limited once diagnosed, is there consideration for lifestyle change as part of treatment?

Dr. Carrie Peltz: Absolutely. So, you know, certainly it’s not, you know, you don’t have to give up once a dementia diagnosis is made, however in terms of the brain pathology a lot of damage has already been done, but there have been studies to show that sort of lifestyle changes can, you know, give a lot of quality of life improvement. So, you know, people that are more physically active and even socially active after their dementia diagnosis do better, they’re happier, they, you know, stick to their treatments well, but they just are able to maintain as opposed to decline. People who don’t have that support decline faster than people who do so, certainly as, you know there are changes that after the dementia diagnosis that can help, but generally people don’t get better I guess is what I’m saying. It’s not like you can reverse the damage that’s been done.

Rob: Thank you. It sounded like you suggested MCI is a more severe cognitive problem than dementia, is that the case?

Dr. Carrie Peltz: No, mild cognitive impairment is less severe than dementia. So generally a person may be diagnosed with mild cognitive impairment at the beginning of the disease process, when they are having some, say, memory problems, but they’re still able to function at a normal level, and then that moves to dementia once they have some sort of impairment such that they’re not able to do their normal life tasks. So the definition of dementia requires that you have some sort of impairment in daily functioning, so you’re not able to, say, do your own medications, or your finances, or you’re not able to drive anymore. Whereas mild cognitive impairment doesn’t. If you can’t have any sort of impairment in your daily life, then get an MCI diagnosis.

Rob: Okay, thank you. At this time there are no more pending questions. Dr. Paulma [phonetic 40:29], would you like to make some closing comments?

Dr. Paulma: Yeah, we’d like to thank Carrie and Dr. Kristine Yaffe for this illuminating discussion using big data. We got to understand that there are limitations to the granularity in using big data, but the significant contributions to understanding prevalence and mediology. We look forward to their oncoming work and the abstracts in submission. And thank you very much, Dr. Peltz and Dr. Yaffe, as well.

[ END OF AUDIO ]