



## **Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) Webinar Series**

**November 13, 2014, 1-2:30 p.m. (EST)**

### **“Technology Interventions for Traumatic Brain Injury”**

Thank you for standing by. At this time all participants are on a listen only mode. Today's conference is being recorded. If you have any objections you may disconnect at this time. I would now like to turn the meeting over to Major Pam DiPatrizio. Major DiPatrizio, you may begin.

Thank you. Good afternoon, and thank you for joining us today for the DCoE Traumatic Brain Injury November webinar, Technology Interventions for Traumatic Brain Injury. My name is Major Pamela DiPatrizio, and I am Chief of the Office of Education Outreach for the Defense and Veterans Brain Injury Center, or DVBIC. I will be your moderator for today's webinar.

Before we begin, let's review some webinar details. If you experience technical difficulties, please visit [dcoe.mil/webinar](http://dcoe.mil/webinar) to access troubleshooting tips. Please feel free to identify yourself to other attendees via the Chat box, but refrain from marketing your organization or products. Today's presentation references and resources are available for download from the Files box and will be archived in the Online Education section of DVBIC's website.

If you are preregistered for this webinar and want to obtain a CE Certificate or a Certificate of Attendance, you must complete the online CE post-test and evaluation. After the webinar, please visit [continuingeducation – one word - .dcri.duke.edu](http://continuingeducation-dcri.duke.edu) to complete the online CE post-test and evaluation and download your CE Certificate or Certificate of Attendance. The Duke Medicine website online CE post-test and evaluation will be open through Thursday, November 20, 2014 until 11:59 p.m. Eastern Standard Time.

Throughout the webinar, you are welcome to submit technical or content-related questions via the question-and-answer pod located on the screen. All questions will be anonymous. Please do not submit technical or content-related questions via the Chat pod.

I will now move on to today's webinar, Technology Interventions for Traumatic Brain Injury. The integration of innovative technology tools to support the assessment and treatment of traumatic brain injury is an area of increased interest to providers in the military healthcare system. Technology tools may provide increased compliance with treatment and engagement with care, increased validity of patient reports, and efficiency in the delivery of care by maximizing engagement between sessions to make meaningful, lasting changes in the lives of patients.

At the conclusion of this webinar, participants will be able to identify innovative technology tools and their impact on clinical practice with patients who have sustained a TBI, describe technological tools which can help minimize or eliminate the short- and long-term adverse effects of military-related TBI, examine research, legal, ethical, and other considerations when employing technology in TBI care.

Dr. David Cooper is a psychologist in the Mobile Health program at the National Center for Technical Health and Technology, a Component Center of the Defense Center of Excellence for Psychological Health and Traumatic Brain Injury. He serves as Program Manager for mobile applications related to military and veteran traumatic brain injury and psychological health and leads a team of software developers, usability researchers and geographic designers to create, develop and deploy mobile and web-based applications. Dr. Cooper has previously worked as a clinician in the field of neuropsychology and neurorehabilitation and developed and deployed digital strategy solutions for the federal government and national associations.

In his spare time, he is a co-organizer of Quantified Self – Seattle, part of a national movement of individuals looking at the application of personal data collection for increased health benefits.

Thank you very much today, Dr. Cooper, for joining us.

Thank you very much, Major DiPatrizio. Hi. My name is David Cooper, and I'm with the National Center for Telehealth and Technology. We'll get things started here. Before we do, a few disclosures. Of course, some of the views expressed in this presentation are my own and don't necessarily reflect the opinions of the DoD or the U.S. Government. I will be discussing some commercial products. Certainly don't want to discuss about off-label usage or investigative usage. I will be mentioning them, however, as things that are representative of the current state of technology in the field. Most of these will be working on patients' personal devices. Few, if any, will work on officially-sanctioned DoD devices. So that's a challenge with some of these as well.

One more disclosure before we begin. If you've tried to access the T2 website, of course, as is the usual with technology, it's currently down when we need it most, so the website links are correct. It's not you, and it's not the link, it's just the website. Our technicians are diligently working to get that back up and running for us.

So, before we begin, just some quick polling questions. Here at the National Center we're always trying to understand the needs of our providers better, so just a few kind of housekeeping polling questions.

[I am familiar with the mission and resources of the National Center for Telehealth & Technology. Yes/No]

Good. Looks like about a 50/50 result so far. I'm glad to see we have a mix of people who are familiar with our resources and those who are not.

Next question revolves around our products, so trying to get a better understanding of how folks have used our products, whether or not folks are using them in clinical care.

[I have used T2 products such as Breathe2Relax and PTSD Coach personally or in my clinical practice. Yes/No]

Good. Again looks like about a 50/50 split. Looks like the folks that know us, use us. And hopefully we can make the rest of you converts before the end of the presentation.

One last polling question about your familiarity with technology and how you use it compared to people you see.

[Health care providers and service members are very similar in the kinds of technology they use and how they use it. True/False]

Okay, great. Looks like most of you chose false, and we'll get into why it's false shortly.

So, to get things underway, what are we talking about when we're talking about the use of mobile tools? You know, we're really talking about the idea of healthcare anywhere. mHealth, or mobile health as you may have heard it described, is using technology to expand our capabilities when it comes to delivering healthcare. With technology we can reach folks in the 99% of the time when they're not at our clinic. The white space as you may have heard it referred to. When you see people for an hour a week, or sometimes more if we're lucky, but really then send them out into the world to make their own way, using technology and especially mobile apps and things like that, give us the resources to expand our clinical care beyond what we do in the clinic to really engage with folks outside and make more of a difference in their day-to-day lives.

So a little bit of introduction. Who is T2? The National Center of Telehealth and Technology, a DCoE Center, so that means our work revolves around psychological health and TBI. What that means is we take the issues of psychological health and TBI, and our specific mission is to find technology solutions and ways that we can improve that. So we are DoD's source for telehealth policy. We have a branch that does research on TBI and a lot of technological interventions we're doing right now. We make mobile applications and websites. And we're always looking at new and innovative ways to expand the technology and figure out new methods for integrating this into care.

So you may be asking yourself why technology in the first place. Well, as we all know, it's becoming a bigger part of our daily life. And really, psychology is a field I think we can all admit is not necessarily the most tech savvy field. So we feel like we provide a unique resource for people looking to integrate these two fields. And as the polling question kind of hinted at, providers use technology in very different ways from service members. So some of the work we do here is involving research with service members. How they use technology. What kinds of things that they're using.

So just to give you an idea of how different the provider experience is from at least service members, almost 90% of service members own a smartphone, primarily android smartphones. Most of them are regular gamers. Most of them don't own a tablet. And if you look at providers, you see almost the exact opposite. Most of them own a smartphone but it's primarily an iPhone. Most of them don't play videogames and they mostly own iPads. So when you're thinking about technology use and incorporate these in treatment, as we'll talk about later, it's important to realize the difference between your experience with technology and that of your patient.

As an issue of competency, which we'll also get into, this means that you should be familiar with both kinds of phones, for example, understanding how different applications may work differently for your patient than they do on your phone.

Going into it in a little bit more detail, they're mostly texting, service members are mostly texting, browsing the web, playing videos, playing games. Whereas providers tend to use social media about the same but are mostly using the smartphone as a communication device.

So most low SES (socioeconomic status) folks, I know it can be an issue of access. So, for example, according to the Pew internet research in 2012, of the folks who are making about \$30,000.00 to \$50,000.00 a year, 45% of them have smartphones, and under \$30,000.00 a year, 30% of them have smartphones.

So we're talking about access. I know that's always a question with technology is who has access to these. Is it only wealthier folks? Although that data is from 2012, I'm sure it's changed, increased since then. That's been the trend so far.

So the application technology isn't exclusively a higher or middle SES resource, it's increasingly becoming available to those in the lower SES categories.

Additionally as well, those in the lower SES bracket are more likely to get a smartphone, increasingly likely. If you think about it, if you have \$200.00 or \$500.00 disposable income to buy a piece of technology, are you going to buy a medium phone and a kind of a low-end laptop, or are you more likely to maybe get a tablet or a higher-end smartphone and use that for most of your technology interaction. And that's what the data according to Pew shows, that they really follow that pattern.

So, really, though, what's the heart of the question? Why are we talking about technology at all? In terms of working with military populations, it gives us some significant benefits. Really it's about overcoming barriers to care. Thinking logistically, how many of your patients live more than an hour away from the clinic? How many of them live/work in a predominantly rural population? How many of them are Guard, Reserve, maybe don't have access to bases on a regular access?

Stigma. We all know stigma is a huge issue when it comes to behavioral health. The nice thing about using technology or apps in general is I like to say nobody can tell if you're looking at Facebook or if you're learning about PTSD through something like PTSD Coach. So, whereas if you have a self-help book, if you have a printout, if you have something like that, that can more easily be seen that that's directly related to behavioral health and make people more reluctant to engage in care.

So let's get right into it. What are some of the resources that we can use for working with TBI patients and technology? Let me talk first about some web resources that we have available. One is our Afterdeployment.org website. We have an mTBI section – we have a number of sections, actually, on issues like anger, anxiety, PTS, smoking, as well as mTBI. We have nice video stories explaining what a TBI is. We have workbooks that people can access digitally and work through on their own. We do have assessments. They're currently down right now as we transition to a new web server, but they're nice because if you have patients in pre-contemplation stage, or contemplation thinking - do I really need to work through this? I think I can just get better on my own. Those kinds of assessment, private assessments, can get them thinking - maybe I do need to work on this a little bit more.

And we have personal stories as well. That's always a nice touch. Working with service members, we find that they respond much better towards hearing information from a fellow

service member or someone who's experienced it before rather than from some preachy clinician. Certainly not me, I never get preachy.

We also have a website specifically for kids. Kids can often get overlooked in the recovery process as we're treating the family as a whole. Military kids especially have very few resources that are tailored towards them and their experience. So we stood up the website [MilitaryKidsConnect.org](http://MilitaryKidsConnect.org) to address these issues. And within the website we have a series we call Tough Topics, where we deal with issues like PTS, mTBI, physical injury, grief and loss. And we deal with them for children, teens and tweens, and then have experts to also speak on the issue for parents or for older children as well, older teens. And it's really a nice way, a nice resource, to give especially to young children who may not fully understand why mom or dad is acting differently now. They look the same. Why can't they act the same? Why are they always yelling at me? We cover a lot of these issues in our Tough Topics program. And it's generally a good resource, and I think one of the few to address these for military kids.

We also work with the VA on a lot of issues. Two websites we stood up recently are particularly applicable to TBI. One is [StartMovingForward.org](http://StartMovingForward.org), and that is dealing with problem solving therapy, so figuring out how do you take apart an issue, how do you think your way through? And I think it's geared at a level for – especially for mild-to-moderate TBI folks. People with good reading comprehension. It can be a kind of self-paced kind of course for them to deal with issues of executive function.

We also have [VeternParenting.org](http://VeternParenting.org) – I think it's actually [veteranparenting.va.gov](http://veteranparenting.va.gov) now – that are resources for couples to deal with a lot of issues that, again, are unique to our service members and veterans. One issue that it does cover is emotional and physical changes and injury and how to deal with these as a couple and as a family unit. So, again, I know that when I worked with patients, that was always a challenge for me is how to bring the rest of the family into treatment rather than just working exclusively with the patient in front of me. And I think these can be good resources for you to hand out and give to spouses and caregivers to help them understand what the person is going through and give them resources as well.

So since apps are my area of expertise, I want to go into those. As with the websites, there are many, many more resources available than the ones I'm going to talk about today. One of the challenges in working with both apps and websites, and technology in general, is that there's no one really vetting what's good and what's not. That's going to be incumbent upon you as the provider to really, as we like to say, kick the tires on some of these. You have to download them, investigate them, use existing guidelines for telehealth and telepsychology to guide you through these applications.

But I do want to talk about some applications that can address specific problems. Memory pain, executive function, common issues that we all deal with when we're treating TBI patients. So let's talk about memory first. In the past, I'm sure many of you have probably had someone recommend apps like Evernote or To Do lists. And I have to admit in the past I've been guilty of recommending those as well. I think that they can be nice catch-all applications to capture everything and kind of become that spare memory. I'm probably biased because I use some of those myself so I don't forget things.

But, really, I think, when we're talking about TBI patients, for many TBI patients, they're pretty complicated. The great thing is now the technology on the phone has caught up to a point where we can really start to use the phone itself as an assistive device. So, for example, both android and IOS phones have an integrated voice feature now, and the nice thing about that is it

works fairly well regardless of accent, maybe if you have severe aphasia, that will probably give it some difficulty, but for the majority of patients, it's a really nice way to quickly interact with the phone. I know I have my phone, and with my Google phone, I know that I can say, remind me to talk about this again in five minutes. The phone will process all of that, set a reminder without me ever having to touch the phone, and then again will give me a notification in five minutes that, hey, I need to talk about this again.

So both Google and Siri can use that kind of technology for search, for integrating with mail and calendars. Again, I know my experience, I can say, remind me at 12:00 on Sunday to feed the cat, and it will automatically process that language, automatically enter a reminder into my calendar. I can go in and check. Yep, it's right there. At 12:00 I need to feed the cat on Sunday, and automatically give me a reminder.

So rather than downloading some extra apps or getting into whether you have to pay for them and how good this application is, it's really about using the phone itself in terms of what we're already doing so you can see how this replaces or is helpful when things like working with an OT, for example, helping patients keep track of their schedule. And that's really the benefit of the phone as an assistive device.

Think about the things that you're already using or were trained to use in terms of treatment. Things like cameras, audio recorders, audio playback devices, notepad, calendars, schedulers. All of that now is in a single device. You don't have to do anything different. You can use the same techniques that you're already doing, but just instead substitute the phone as your technology piece of choice rather than tape recording or all these separate tools. It's now combined in one.

There are also some other built-in functions that you can use for reminders as well. Notes features. A lot of phones coming with built-in notes features you can use, again, to record things. You can do voice recording, again, to drop (inaudible) voice. Speech to text. Or even some keyboards now, rather than having to punch it in manually, can allow you to swipe back and forth. So let's say you have a TBI patient with a fine motor problem. A swipe-type keyboard may be a less frustrating interface for them to interact with the phone. Or even a voice interaction is better than trying to kind of hunt and peck and deal with those.

So these kinds of applications can help you – again, they're always available. A lot of them synch across the web, across mobile. They're automatically saved and backed up. They're free. They're easier than other apps because they're integrated with the phone already. You don't have to do anything extra to have this downloaded app talk to my calendar or allow it permission. Already built in. Nothing extra to learn. So as soon as they get the phone, they can start using it in treatment and start building a work flow that's appropriate towards them and their needs.

And the nice thing is they're also highly customizable. You can use these tools, again, the same way you would use any tools that you're already using with patients.

So let's talk about pain. Pain is always an issue. There are fewer resources for this. A good one is the WebMD Pain Coach application. No matter what we may think of WebMD and the diagnosis service they offer many of our patients and how much we enjoy that, they do actually make a nice application for tracking pain that allows you to get a lot of good contextual information. Again, one of the benefits of these apps is that people who are already using their phone, especially some of our younger service members. I know something like 60% or more of

service members are under the age of 30, so these are going to be people who grew up using computers. I know not all of us did. I'm currently doing a job that didn't exist when I was in grad school, so it's an area we're all kind of learning and growing into. But I know if I gave a 20-year-old service member a piece of paper when there was an application they could use on their phone, they would probably look at me like I had two heads. What am I supposed to do with this piece of paper? And for me, I don't have to see them filling it out five minutes before my session. I don't have to worry about them losing it. It's on the phone. It can be integrated with reminders to ping them throughout the week so that you can get that ecological data, that you can know, okay, I know they're filling it – they're getting a reminder to fill it in every day at a specific time, and so you can help them work to get you the data that you need. Data in that white space.

One thing to mention about this application and other free applications, especially ones not from folks with the government like T2, is that there's a saying, if it's free, then you're the product. So you always have to be careful when you're downloading especially free applications, especially around health data, who is sharing this data? Who gets access to this data? What are they doing with it? And, again, the reason I like to use the WebMD Pain Coach application as a good example is that they have a pretty robust privacy policy that this is what we do with your data, and this is who we share it with, and we don't share it with anybody. So what they're getting out of it essentially is more data on the people who are already using WebMD so that WebMD can serve them better. But they're not necessarily selling it to a third party. Or at least that's what the privacy policy says.

But it can be an issue with other apps, and it's something you're going to have to check out individually because, like I said, there isn't a good resource right now that vets all these applications and tells you all this stuff. Unfortunately it's something like email, like computers, like the internet that we're just all going to have to become savvier about using something that we were never necessarily trained on but is going to be an issue going forward for us as we treat folks and as technology becomes more ubiquitous.

So similar to memory, the phone can also serve as an assistive device when it comes to executive function. For example, Google has a service they call Google Now that what they say it populates with what they call just-in-time information. So when I use Google Now, I let it read my email and read my calendar so that I have a one-stop-shop where I can go to. It will automatically remind me I have an appointment. It will automatically, if I'm having dinner at a friend's house, Google Now will read my calendar to know that I have an appointment at a friend's house to go eat dinner at 5:00. It will automatically scan the traffic on the route from my house to my friend's house if I've entered in an address. And it will tell me, hey, you need to leave now if you're going to get there by 5:00. Because it's constantly monitoring this sort of stuff, I don't have to check it. The phone is doing it for me.

So you can see the applications here for somebody with executive functioning difficulty. Getting them automatic reminders of when they need to leave for appointments that, at a touch of a button, automatically connects to the phone navigation system that gives them directions to get there. If they're taking a flight, it automatically tells you the flight is on time. It even can tell me where I parked, so the phone knows because I'm traveling at a certain speed and all of a sudden I stop, well, probably I was in a car and I pulled over and I parked and I went somewhere else. So if I forget where I parked, I can just pull that up. Oh, right, it was in this general area. And, again, the nice thing is, I don't have to do any of this. I just have to feed it this information from my calendar, from my email. And it's doing all the work for me.

So, again, for folks with mild to moderate TBI, you can see the potential benefits of something like this, integrating this into their daily work flow so that they only have one place to go check what my schedule is, what's going on, what do I do next, what happens next. And they can easily access that information in a visually-appealing way and it makes it very clear what's happening and gives them next steps built in to the little card that you see there. And that's available, even though I said Google Now, it's available on android and iOS phones, so regardless of what your patient has it's available for them to use.

So let's talk a little bit about behavioral health. Again, that's our bread and butter here at T2. So we make apps for behavioral health. One of our kind of flagship applications is the T2 Mood Tracker. Just as with the Pain Coach, and I'm sure we've all had experiences of giving people paper diaries to take with them and fill out between sessions and then never getting them back. This is a similar thing but for mood. We pre-populate it with relevant things to military and the veteran population, like scales for TBI symptoms, pain symptoms, PTSD symptoms, anxiety, depression. It's a simple positive/negative rating category that can give people an easy way to dip in and dip out for how are they feeling right now. Get reminders, so you can help the patient set reminders throughout the week. Again, not something they're going to have to manage. Once you punch it in the phone, the app and the phone does it all for them. And so they'll get a notification, hey, it's 10:00, fill out your Mood Tracker. Click on it, and it takes them right into the application where they can easily rate their mood, how they're feeling, rate their pain.

It shows you the data over time so you can see if there are any changes in mood. And, again, the benefits for you as a clinician of using these kinds of applications is you're going to get more ecologically valid data whereas, again, they might lose a paper copy, they're always going to have their phone with them. In fact, again, Pew showed most people have it with them on an average of 22 hours a day. They use the phone – they sleep with the phone. (Inaudible), it's my alarm clock. So I always have it with me. I'm always going to be able to jump in and rate that mood. Whereas pulling out a piece of paper as I wait in line at the Post Office or something like that can be cumbersome. Or I can just quickly pull up on my phone, swipe, swipe, swipe. Done. So that means more data for you about how patients are functioning outside the clinic. If you're not going to see a patient for a while, maybe the appointments are backed up, and so instead of every week you have to go to two weeks, three weeks. Maybe the patient is getting new meds and you want a finer scrutiny of how they're reacting to those new meds. Applications like Mood Tracker can really be beneficial for that.

Another one of our applications is Breathe2Relax. So diaphragmatic breathing is a technique I've tried to teach all my patients as a simple way for them to get instant relief for anxiety. Typically I do this over a couple sessions, teach them in my office, follow up with them, assign them some homework. Now, with an application like Breathe2Relax, I can give it to them and it's completely self-guided. It contains videos. It contains ratings to let them know how they feel before and after. It contains a tool to help guide them through the process of breathing. It's customizable, so if you have big lungs you can make it longer, if you have small lungs you can make it shorter. And it's always available for them to watch videos over and over and over again. So especially if they're having problems with memory or they need that extra attention, you don't necessarily have to spend time in clinic going over it with them, they can do it all through the app and do it all outside the clinic.

You can even give this to people before they ever even come in and see you. Pre-intake you can recommend something like this for patients with anxiety because it is completely self-guided with information about how diaphragmatic breathing works, how the body reacts to stress, and, again, guided videos on how to do diaphragmatic breathing.

Another application that's beneficial for many of us, TBI or not, is PTSD Coach. So this is the kind of application that can really be used to address stigma reduction because it contains a lot of information on PTSD with self-assessments, it can be used by a patient or a spouse to track patients outside the clinic, help the patient or the spouse learn more about PTSD, what's going on and how can they – things they can do to feel better. So it can be a nice, self-contained learning tool, again for patients or spouses dealing with these types of issues on top of TBI issues.

Virtual Hope Box is another application we've just released that we're pretty proud of. This is really for instilling hope in patients. I know when I worked with patients, one of the biggest issues is grief and loss. Defense of self that who I was is not who I am now, and I can't do all the things I used to do, or they're more difficult. And the pressure gets pretty common, especially right after injury. So with something like Virtual Hope Box you can use the phone to have customizable pictures, video, music, things that inspire hope in the patient, give them a resource to access when they're feeling down so that they can feel more hopeful. It's got distraction tools if they feel particularly distressed, can connect them with resources, suicide hotlines, other clinic hotlines, as well as containing some of the breathing tools from Breathe2Relax, and coping cards for more cognitively-inclined patients, maybe more milder TBI patients, about, okay, this situation X distresses me, here's what I normally do, here's what I'll do instead. So you can fill out these coping cards that the patient has access to, and again, over and over and again it can be a good reminder for, again, patients with TBI outside the clinic to reinforce some of the things that you're already working with them on.

Sleep. We all know sleep can be disturbed after brain injury. So there are a variety of applications and tools that you can use. A free one is the CBT-I Coach made by T2 and the VA, the National Center for PTSD. Really following along with the recommendations for CBT for insomnia. You're going to have sleep diaries, you're going to have rating scales, tools, things to learn about for good sleep hygiene. However this might be a little more complex for some patients, especially more moderate to severe TBI.

So what do you do for those patients? Well, with the new wearable devices, they give us a really good opportunity to gather some of this data without the patient having to necessarily enter anything at all. Wearable devices like this fitbit or the Jawbone Up that you see here. They collect data on movement, on sleep, and nutrition, a lot of time with minimal to no need for the patient to interact with it at all. So thinking about how you can use this in treatment, if the patient has one of these devices, your PT can see how are they moving outside of the clinic. Are they actually following through with walking recommendations? Or are they just sitting on the couch? How are they sleeping? With these devices worn during sleep you get a pretty good idea, certainly not gold standard, but it's good enough to let you know, okay, on average, how are they sleeping at night? How long are they sleeping? What's the quality?

And then with things like the Food Diary, they're increasingly easy for people to track what they eat. So I know, for example, the Jawbone Up, you can either scan the barcode, if it's like a frozen meal, you can scan the barcode, and it'll log what you ate. You can look it up. They've got a pretty robust nutrition base. Or even easier, you can take a picture of what you ate. So with really minimal interaction from the client, minimal effort, you can get a pretty broad range of all of their activities outside the clinic which gives you a much better idea of how treatments are being effective, how is what you're doing working.

So that's kind of what's out there. I also want to talk about a big issue with this is ethical considerations. As the sign says, there's isn't a moral compass app, and unfortunately there

aren't very specific guidelines to how to integrate this with technology. So we have to kind of adapt what we find in the telehealth field and what we already know and just applying it to technology.

So, just thinking about it yourself, whenever you use any new treatment or tool in therapy that you're not familiar with, what do you have to do? What ethical considerations do you have to think about? Certainly competence is one. How is this going to interact with my patient? Is my patient going to be interested in this or am I trying foist something on them? Or vice versa, is my patient very interested in this and I'm resistant and I'm not following along with the needs of my patient?

So let's talk about each of these kinds of things as they apply. Oops, there's my Calvin, obligatory cartoon. When you're talking about ethics, it's always – you always have to make sure you put in a cartoon. Oops, not showing up. Never mind.

So let's jump right to the guidelines for telepsychology. APA has guidelines for the practice of telepsychology that, while traditionally are thought of as applying to the more face-to-face, camera, telemental health that many of us are doing in the DoD VA, we can kind of crib some of those into what we know for mobile health and using apps. And they really apply.

So what kinds of things do they talk about? They talk about issues of competence, human relations, confidentiality are big things that are all applicable when we're talking about mobile health. Competence, of course, is pretty clear in a way that if you're going to use these tools, you have to be familiar with them and you have to be comfortable with them. Simple rule of thumb is know it and use it before you use it. Again, mobile technology is becoming an increasingly integral part of our daily life, so just like you have to be familiar with things like internet, computers, office, email issues, issues with social media, this is one more thing that we all need to become more competent about in using in treatment and being aware of as it comes to working with patients.

Human relations. Multiple relationships, conflict of interest. Be aware of boundary issues when it comes to using these sorts of apps. Many of these apps have a share function, for example, that make it easy to post data on social media or send email. So be aware that it can very easily – a patient, especially a TBI patient can very easily share something with someone they didn't intend to, share something with you that you can share something you didn't necessarily intend to. Being aware of how these kinds of work, again going back to the competence issue, being aware how these applications work. And also, again, being aware of conflicts of interest. Like I said, if it's free, you're not paying for (inaudible) the product, so who is benefitting from this? Are there any potential things that patients should know about? Again that goes to informed consent, making sure you're savvy enough as a provider to explain these sorts of things to the patient. Making sure they know what they're getting into and why a mobile phone can be different from a piece of paper. In some ways – so for example, securing their phone. If a patient is going to be carrying around all this data on their phone, they should probably put some sort of password protection on it. Otherwise it's just like carrying around pieces of paper. I know we're all use to that, but as things goes digital, it becomes much easier to move things around, lose things, delete things. And they need to be aware of those possibilities. So, again, being informed as a provider about the technology and the security needs of the technology helps you give good, informed consent to your patients when you want to use this in treatment.

Same thing with confidentiality. When it comes to confidentiality, again, the technology is very easy for files to get transmitted from one place to another. And, again, with using a mobile

phone, a lot of apps have access to hotlines or allow providers to put their information in as the contact number. So working with patients to set boundaries for those. Letting them know that unless they do lock their phone, someone may be able to get access to it, a friend or whoever. I think we've all had that experience of trying to show a friend a photo, and then they start swiping and all of a sudden you're like, no, no, no, no, you can't look at the rest of those photos, I just wanted you to see that one photo.

Same thing for patients. Making sure that if they're using a device with you in therapy, that they only show you what they intend to show you, and vice versa, that you're not intruding on their privacy. I know a friend of mine when using a device with a patient immediately, for example, grabbed the phone and said, here, let me show you how to use it. Well that could be a huge ethical issue if she accessed something the patient didn't want her to see or did anything that the patient would have breached that confidentiality. And whereas we might feel inclined to do that, we have to take these extra steps in treatment to make sure that we respect these boundaries.

So part of my job here, too, is to be an evangelist for these technologies and how they can potentially be used, and we've really changed the way we do treatment. So I want to spend a little bit of time talking about what's next and what's on the horizon to hopefully get you all as excited as I am about the use of technology in treatment, and to hopefully maybe even spark some ideas for research. We are always looking for collaborators, so if you have any ideas, please reach out to us. We're over the moon about all this stuff, and so we like to connect with people who are excited as well.

So what can we kind of expect for the couple of years, five to ten years? What are we going to see? We've talked about what we have already, what's coming next? You're going to see more kinds of sensors that give us the potential for new interactions with devices, that are going to capture more data, and that are going to help us make sense of it. So let's talk about each of these.

So, for example, you can get a blood pressure monitor that connects to the phone. So maybe you have a patient post-stroke and you want to monitor their blood pressure. Well now you can do it from home and have a whole lot of data about how the blood pressure fluctuates throughout the day, which will inform medication, which can inform treatment. Same for patients with peripheral neuropathy or anything like that that are subsequent to a TBI.

You have tools like the Basis band. So this is a little watch-size band that collects your heart rate, your skin temperature, your galvanic skin response, as well as movement like a fitbit. All those together mean you can get a crazy accurate data of how many calories people are burning a day, how anxious are they, how their heart rate and the sweatiness of their skin, the galvanic skin response, how does that change throughout the day. And so you can see data as you go forward, data like this that show, okay what is that heart rate spike at the end of the day? What happened then? Is that just an outlier or was that a particularly stressful situation that my patient encountered that we need to talk about? This is actually my data, just so you know. I'm not showing anybody's data. Happy showing you my own. And I actually saw this, and I looked at it and I pulled up my Outlook calendar, and I'm like what was I doing at that time of day? What was going on? And thankfully it was just an outlier, but it's an interesting thing to think about as we can track all of these biometric things increasingly easy and outside the clinic at home can integrate that into our practice.

Another area that's interesting for TBI especially is wearable EEG headbands. For example this is the Muse headband. It has FP1 and FP2 sensors here in the front as well as over the ears. It does minimal EEG connected through the phone via Bluetooth. Right now the application they have is to promote meditation in kind of the typical neurofeedback way. But you can see now that things like this are available now, what's going to happen in the next five to ten years is you're going to get a full ten, 20 EEG wearable device that you can take with you. So seizure monitoring can be drastically different and drastically changed how we use brainwaves and how we track that data in therapy because now we can. Now we don't have to have somebody hooked up to a bunch of wires, we can just pop it on them and they can go throughout their day.

This is a really neat one that you may not be aware of. It's called the Myo, and it uses EMG centers, muscular movements, to interact with devices. So for patients with fine motor difficulty, patients who may be missing a limb, now they can interact with a phone or a computer in a new way simply by gesturing. One of the applications they have available for this now, simple, but you can control your music on your phone. Next song. Previous song. Play. Pause. I've seen some work on their website where they've got people controlling the little remote control drones. Moving it up, down, side to side. So tools like this are going to help provide access to some of this technology for people who may have difficulty accessing it now because of physical injury or because of nerve damage.

This is a neat combination of the Oculus Rift virtual reality goggles and something called the Omni Treadmill. These are really going to open up virtual reality, for example, as a tool for us to use in the clinic. You're not going to have to buy a multi – hundreds of thousands of dollars of equipment. You're going to plunk down maybe a thousand bucks tops for both of these together. And you can think about this in terms of how it will affect balance remediation for example. How this will work with helping patients work on real-world tasks in the clinic. So you can project a virtual kitchen, for example, and have the patient actually walk through all the steps that they're going to need to do in their daily life, sort of like the BADS, if you've ever used the behavioral assessment of dysexecutive syndrome, using real-world tasks to assess executive functioning, this is going to be able to do the same but in a much more interactive and much more engaging way to give us even more ecologically valid data and helping people in the clinic.

Another neat technology is life blogging, so the idea of capturing as much of life as you can. This little camera is called the narrative. You can see it's really small and it clips on. And what it does is it takes a picture every 30 seconds and then uploads those into streams so you can go back and see what you were doing throughout the day. So very quickly we're going to get to the point where you can sit down with a patient and actually review their week with them. You can actually say, hey, what were you doing on Tuesday? Let's go back and take a look. You OTs can quiz patients. Who is this person? What is their name? Helping reinforce some of those visual stimuli and learning. And, again, giving you a more complete picture of the time outside the clinic in the white space.

And then lastly, with all these data, we're going to need better ways to put it together for us. So there's services, like Exist, that take data from all these different areas and start combining them together to give you insights without you having to sit down, look through data, compare columns. That, okay, you're more likely to climb floors when you check in. You're more like to do certain things. So you can get an idea of, oh, okay, this is what all this data means. This is what all this data is good for. These are actionable things I can work on.

Same thing. Jawbone is doing a similar idea of giving you feedback on your data. Oh, you slept less than 50% of people. Your most active day is Wednesday. Well, why is that? It gives you that idea to start – what am I doing on Wednesday that makes it more active and how can I apply that to other areas of my life? Why am I sleeping better on Mondays as opposed to other days? Helping you really hone in on things that can be beneficial for the patients.

But for all of the things I've kind of talked about today, so we've talked about websites, different things that you can use, we've talked about applications that you can use as well. The ethical considerations that goes into those, as well as some of the technology that's on the horizon. So kind of final things to leave you about before we get into questions. When you're trying to think about new technology and incorporate those in your treatment, what's the quality of data that you're getting? Certainly it's not necessarily going to be gold standard. Is it good enough? Or are these kind of some hucksters trying to make a buck with new technology. If you've heard Kickstarter or (inaudible) GoGo, these kind of crowdsource in funding, that's where a lot of this stuff got its start. And for every one of these technologies that's really interesting and promising and doing good work, there's probably ten, 15 others that aren't going to go anywhere. So being kind of skeptical, seeing how things work out.

Thinking about issues of quality in treatment and engagement. One of the challenging things about working with technology, it can be hard to get a good evidence base. So at T2, for example, we use what we call evidence informed treatment. We take things like the Hope Box, like diaphragmatic breathing, that we know works, and apply them using technology. And those are the kinds of things you need to look for. Otherwise, we have to wait for years to do a randomized controlled trial (RCT). Don't even get me started on IRB approval for some of this stuff. And then, not only years for one RCT, then you have to worry about building up an evidence base, and by the time you're 100% sure that this app helps, we're using holograms or something else completely different. So you have to kind of balance using your experience and your clinical judgment with what has an evidence base and what is kind of hucksterism or quackery. There's a lot of that out there. A lot of people selling snake oil through apps.

Another thing to think about is feedback is key, not only in looking for applications that provide feedback to the person, but getting feedback from the patient. How is this working? How are you liking this? Can we do something else? Would you rather do this or would you rather do that? Having options. And in order to have those options, to have that list of resources, you need to jump in. Don't be afraid. You're not going to break anything. Download an app, check it out. Understand how your phone works. Understand how other phones work. It's really exciting and really interesting and by jumping in as a provider you start getting an experience base that you can then help your clients learn. And you can feel confident as a provider to engage with some of these things.

We have resources here for you to use and look at. We're always available for more information. Please don't hesitate to contact us, even when our website isn't working. Email me. I'm happy to talk more about anything here today if we don't get to your question. But I would like to stop and turn it over to questions at this time. I hope you've been saving up a lot of them. I'm ready to go.

Thank you, Dr. Cooper, so much for such an excellent presentation on the advanced technology with assistive devices that are available to improve the quality of life of our service members who have sustained a TBI. That was an excellent presentation.

Thank you.

The Defense and Veterans Brain Injury Center develops and distributes printed educational materials, including clinical recommendations, patient education, and family resources. Over the last year, DVBIC disseminated more than two million educational materials free of charge to service members, veterans, healthcare providers and family members. DVBIC offers the following symptom management fact sheets to educate patients who have sustained a TBI on how to manage conditions related to head injuries. Headache and Neck Pain, Changes in Behavior, Personality and Mood, Head Injury and Dizziness, Healthy Sleep, and Ways to Improve your Memory. These fact sheets are available as PDFs which can be downloaded from the Files pod on the left-hand side of your screen or at DVBIC – [dvbic.dcoe.mil](http://dvbic.dcoe.mil). Hard copies are also available and can be ordered through the Shopping Cart at the website. Visit [dvbic.dcoe.mil](http://dvbic.dcoe.mil) to browse DVBIC's 70-plus products.

It is now time to answer questions from the audience. If you have questions and you haven't already done so, please submit them in the box located on the screen. We will respond to as many questions as time permits.

So I do have some questions here. Dr. Cooper, are you familiar with any studies being conducted which test the accuracy of the Jawbone fitbit in tracking sleep?

I do know some sleep research – we have been contacted by a few – who are actually looking at that very thing because they're excited. They know it doesn't necessarily meet the gold standard, again, of a sleep study where you're going to have full EEG and hookup. But what they're finding is that, again, the data is good enough for a lot of clinical applications. Again, I don't know of any offhand that are in publication, but I do know of a couple that are actually going on right now to answer that very question.

Thank you. I have another one. Do you have any idea of how many people are using the T2 applications?

Yes, actually, we have a lot of information on downloads. For example, our Breathe2Relax application has been downloaded by hundreds of thousands of people and used over a million times. So we are getting the sense that these are tools that people want and need, and, at least for us, we want to fill that gap of not having good resources, not having available resources that you know are based on quality clinical evidence. So with all of our applications they are free to download. Most are available on both android and IOS stores. And then if you're interested in research, we have some of the actual code that we used to develop the applications that we make available as well. So all of these products, we're very much about sharing, encouraging people to use these tools, and making tools for patients and providers in this area.

Excellent. I have some more. Let me see. Can you describe the biggest challenges associated with assessment and management of TBI in different military environments?

Well, I think a lot of it is going to revolve around the same issues that we have with psychological assessment, getting people to identify and come in for self-assessment when they know they're having a problem. For many of the more severe cases, that's not an issue. We go to them in the hospital. But especially for our milder TBIs, our men and women that sustain concussions, for example. Helping them recognize the signs and symptoms of concussion, helping them get into treatment and know that it's okay to seek out treatment, is really probably the biggest challenge. The DoD is doing a great work in being innovative in terms of assessment tools for mTBI, the DANA tool, the ANAM. We're really trying to push the forefront of this. But I think the most challenging thing is getting folks in the door. And so that's where

things like PTSD Coach, or the newly-released Concussion Coach app from the VA can help people understand what the signs and symptoms of concussion are, do some of those self-assessments, and get involved in treatment, and recognize, okay, maybe I do need to go in and see somebody. And then I think once we have them in the door, we do a great job of going forward from there.

Awesome. I have a few more. Can you discuss performance and symptoms validity issues that are unique in the context of the MTBI in military populations?

Well, I think we all know that performance and validity issues are, for lack of a better term, and issue, regardless, in the DoD, and I think, again, the work on milder TBI, it's much more of an issue when we're dealing with mTBI. The benefit is, again, some of the work that our folks in the DoD are doing for this is really fantastic. There's a group at USUHS, for example, looking at saccadic eye movement in terms of assessment in mTBI. That, as you know, is pretty impossible to fake unless you work really hard. So in terms of making sure we're accurately identifying people with mTBI and that we're looking at that symptom validity, these kinds of new techniques and tools using cameras built in to the computer to measure the tiny movements of the eye as they go through tasks are really going to help us in terms of that assessment validity going forward.

Very good. Beyond apps and websites, I've read of some of the T2 involvement in virtual reality-based neuropsychological assessment tests. Could you tell us more about this innovative area of research?

Sure. That's really one of the things that got me into doing this was seeing some of that work at INS, for example, the work Skip Rizzo is doing down in California. I don't know how many of you have seen this, but he did a virtual Connors Continuous Performance Test for kids. And he made a virtual classroom and hooked kids up with a head mount. And so you're not only doing the Connors, you're doing it in an environment where the kids are actually going to be functioning in. He built in distracters. Planes going by. People talking. And not only was it a more ecologically valid way to assess attention for a child, you got a ton of extra data because of the sensors that he hooked up. So you could see the child's head, and he had kind of a normal control, and he sped it up, and the kid's head looked like this. When he showed the ADHD-diagnosed kid, it looked like the Exorcist. The kid's head is flying around and going every which way. It's data that you wouldn't get just sitting somebody in front of a computer or a piece of paper that you couldn't necessarily collect.

So I think that's really where we're looking at and why I talk about things like the Oculus Rift and the VR stuff is that it's going to help us build and create tests that get us closer to that real-world functioning, assessing people's real-world functioning in the clinic. And I know that's always been one of my biggest challenges is taking the data that I collect via pen and paper and then translating that for the patient into what they can or cannot do. With virtual reality it allows us to bridge that gap even better, and I think it's a pretty new and upcoming field. I know research is still being done on that, so I'm excited to see where it goes.

Awesome. I have a couple more. Will these apps work with Window phones in the future?

That's a possibility. We're always looking at that down the road. We focused on android and IOS just because resource available, and honestly those are the two most popular. We're working with technologies now that are going to allow us to hopefully publish on Windows phones in the future and really be flexible enough to go to any operating system, when we get, I

don't know, whatever the next one is going to be. When we start using those holograms, hopefully we'll be (inaudible). So it's something we're working on right now.

Okay. Oh, and my last question.

Sure.

Is there an app that lets patients encrypt data if they're sending it over to a healthcare provider?

That's a good question. And that's kind of the elephant in the room at the moment when we talk about technology. Especially in the DoD. When I ask providers, hey, what can we do – I've actually learned to stop asking this question – stop asking the question of, hey, what can we do to improve your life with technology? Inevitably everyone says, well fix ALTA. That will improve my life a huge amount. And I can't exactly do that. And so I know as we move to DHA in the Department of Defense and the Defense Health Agency, that's one of the things I know that's on the top of the list is figuring out this new electronic health record and how data is going to go back and forth. And, honestly, that's one of the issues with this where the policy and the legal issues like HIPAA haven't caught up with technology. So it's a really challenging thing right now. One of the things we recommend is just, as a provider, just have the patient show it to you on your phone, and then that way you can still get the data, they can still use the tool, and you can write that down, you can enter it into ALTA, but then you don't have to worry about HIPAA issues or any kind of things like that. And unfortunately that's really the best of both worlds at this point because that encryption issue is such a sticky wicket and making sure it's secure.

So I know most of the patient-centered medical homes and the soldier-centered medical homes have gone to using RelayHealth as a secure messaging site between the patients and providers. Have you looked into seeing if any of these applications are – that they can be sent through RelayHealth?

That's actually what we're investing right now. We're looking at things like RelayHealth. I know TATRC has a research environment that allows for application and data sending. It's something we're very interested in, and unfortunately it takes a lot of coordination with different people and different levels of bureaucracy. So we are working on it, and we'd love to get it as much or more than you all would love to get it. Unfortunately, like many things, it can be slow going at times when it comes to IT innovation within the DoD.

Oh, okay. I have – just a couple more questions came through. Does the user have control of what data is recorded and who can access that data?

For many things, I know for the T2 applications, it's all user-generated data. We don't do anything that's going to, for example, record the movement of the phone in your pocket. For stuff like Jawbone, you're kind of getting what you sign up for. That's the purpose of it is to kind of collect this information without you having to enter it or without you necessarily controlling its entry. The benefit is for a lot of those they are secure and you can only share that data with people that you want to. Fitbit I know, for example, you can keep your fitbit data just to yourself or you can authorize people to view your data, like a spouse, like a provider, to be able to get access to that data, and that is all under your control.

Right. And I'm actually wearing one of those, sir.

Good.

So somebody wanted to know if – we're not sure if we missed this – is there a certain application that is available for medication management?

You know, I think that's an area a lot of folks are working on, including us. We're working on a medication management app. I don't have a good one right now, but if you email me, I'll do some due diligence and look out for you. One of the challenges is, of course, getting the list of medications, making it easy for patients to enter in medications, making it easy for people to monitor medications. I know that was one of our challenges. We wanted to have a medication management app where I as a provider, or I as a caregiver, could work with a patient who may be living in my home, may be far away, and that was a challenge we faced, well, how do we do this with all of the kind of security issues and privacy issues. But a good stopgap measure in the meantime can be, again, using the phone as that assistive device. Working with the patient to set up their calendar, set up reminders on the phone, to take medication at a certain time. Taking pictures of the person's different medications with signs of what they're for so that they can look through their phone, okay, the red pill is for my high blood pressure. All of these sorts of things the phone can help us out with until we get that good gold medical management app that I think we all want.

Well that's going to help us in the ER, especially for patients to know what that little pink pill is actually.

Absolutely. Snap a picture with their phone before you send them on the way.

Exactly. Do you recommend any other type of apps for tracking usage compliance on patients or how they can track usage compliance?

That's a good question. Again, I think you can make notes, for example, the simple Note function in the phone can be used to record, took my medication. There are also some very simple tracking apps. There's a variety available. Let's see. I'm trying to think. Things like there's Track This For Me Tap Log, that allow easy entering at a touch of a button. So you can just say, Took my pill. Every time you take it, just one touch, the data is entered, and you don't have to do anything more than just kind of tap your phone.

I know for android and iOS there's a variety of different ones, so if you have a particular interest in that, shoot me an email and I'll be happy to point you in the direction of a few that could fit your bill once I kind of understand more of what you're looking for.

Okay. This will be, really, my last question.

No, (inaudible), I like it.

Do you have patients who resist using applications for fear their data will be being tracked and shared with others?

Yeah. Actually that is a big concern and something we always stress with our applications. Again, we know we're a military organization making apps, and we have users who are rightly concerned about that sort of thing. So we make it very clear in our permissions and our websites that we don't track the information, we don't want to track the information, because we want you to have access to the tools.

Honestly, I think if you have a patient who's that resistant, maybe don't use technology tools. Use the tools that you have. You can work with them to look at privacy policy (inaudible). For example, on my android phone, for example, anytime now that I install a new app, they just updated some of the privacy tools, so for every app on my phone I can go in and see exactly what it's looking at. And in the future, I think with the newest android release that's coming out, you're going to be able to turn that off. So, for android at least, you're going to be able to really define what things apps on your phones can track and what things they won't have access to. So that can be helpful as we go forward.

Awesome. Thank you very much, Dr. Cooper, and thank you again for such an excellent presentation and for answering all the questions.

No problem. And, again, if you have any more questions, please feel free to email me, reach out, we're happy to talk.

Thank you.

After the webinar please visit <http://continuingeducation.dcri.duke.edu> to complete the online CE post-test and evaluation and download your CE Certificate or Certificate of Attendance. The Duke Medicine website online CE evaluation and post-test will be open through Thursday, November 20, 2014 until 11:59 Eastern Standard Time. To help us improve future webinars, we encourage you to complete the feedback poll that will open in a separate browser on your computer. To access the presentation and resource list for this webinar, you may download them from the Files box on the screen or at the DVBIC website, [dvbic.dcoe.mil/onlineeducation](http://dvbic.dcoe.mil/onlineeducation). An audio recording and edited transcripts of the closed captioning will be posted to the link in approximately one week. The Chat function will remain open for an additional ten minutes after the conclusion of the webinar to permit attendees to continue to network with each other.

The next DCoE psychological health webinar topic, Integrating Technology Into DoD Efforts to Promote Psychological Health, is scheduled for 20 November 2014 from 1300 to 1430 p.m. Eastern Standard Time. The next DCoE TBI webinar topic, Performance Triad, Sleep, Nutrition and Exercise, scheduled for January 8, 2014, from 1300 to 1430 Eastern Standard Time.

Thank you again for attending and have a great day.