# The Approach to Pediatric Concussion in the Outpatient Setting - Pediatric Grand Rounds-7-25-25-Meeting Recording

July 25, 2025, 12:29PM

52m 42s

**Kamat, Deepak M** started transcription

**Jane Fried** 0:27
What?
Downloading. I had to upgrade your the name.

**Kamat, Deepak M** 0:37
Can you please mute your microphone? Thank you.

**Jane Fried** 0:40
So.
Yes.

**Kamat, Deepak M** 0:48
Good morning. It's 7:30 in San Antonio and it's time to start our pediatric grand rounds.

**Patel, Mayur H** 0:52
The.

**Kamat, Deepak M** 0:56
Please mute your microphones. I still hear some background sounds. Again, please complete the evaluations at the end of the presentation. The CME code is in the chat box. Please.
If you want any CME credit, I will keep repeating the code every 10 to 15 minutes. It's my great pleasure to introduce this morning's panel speaker, Doctor Mayil Patel, who is a board certified neurologist and brain injury medicines physician who is currently. Professor of Neurology at the University of Texas Health Science Center at San

Antonio. Dr. Patel received a Bachelor's of Science degree in Molecular Biology at the University of Texas at Dallas. He then obtained his medical degree at McGovern Medical School at UT Health, Houston, followed by a complete.

**Jane Fried** 1:37
It.

**Kamat, Deepak M** 1:51
of neurology residency at the University of Texas at Austin. He then completed a neurotrauma sports neurology fellowship at the University of Florida. Prior to coming to Itasca, he was an assistant professor of neurology at Vanderbilt University. Dr.

**Jane Fried** 1:53
So.

**Kamat, Deepak M** 2:11
Patients who have suffered from the effects of traumatic brain injury and their neurological complications. The title for his today's presentation is The Approach to Pediatric Concussion in Outpatient Setting. Dr. Patel, thank you very much for accepting our.
Invitation. The floor is yours. Thank you.

**Patel, Mayur H** 2:30
Awesome. Thank you for the invitation, Doctor Kamat, and the introduction as well. Is my screen still popping up? OK, OK, perfect. All right. So hi, everyone. My name is Mayer Patel. I'm a adult neurologist here at UT.

**Kamat, Deepak M** 2:38
Yes.

**Patel, Mayur H** 2:48
With a board certification in brain injury medicine and I'm going to talk about my experience with treating pediatric concussion because I think that's population that oftentimes, you know, there isn't much information about. And so even though I'm an adult neurologist, I've had some experience treating pediatric concussion as well.

So just wanted to.
To kind of add my expertise and provide some introspection into how I treat them and to see if that can help as well. All right, so I have no financial disclosures. Just wanted to talk a little bit about myself and my training. As Doctor Kumat mentioned, I did my residency in Austin, which is that picture on.

**Jane Fried** 3:26
Yeah.

**Patel, Mayur H** 3:27
On the left with Doctor Kent Ellington at Dell. And the cool thing about adult neurology residency is we get to do pediatric neurology as well. So we did some pediatric neurology rotations at Dell Children's, so got to interact with the pediatric residents and colleagues there.

3:35
OK.

**Patel, Mayur H** 3:44
Then I spent one year at the University of Florida doing a traumatic brain injury and sports neurology fellowship in which we would get to go to the games, which was awesome, but also see primarily patients with traumatic brain injury of all ages in our multidisciplinary.
So that was a fantastic learning experience. And as a result of that, I was able to do the brain injury medicine boards, which is traditionally a PM&R specialty. But as neurologists, we're trying to get more involved in that because there are oftentimes neurologic complications from traumatic brain injury. And so that was a cool part of us getting to be involved.
And then that bottom right picture. So after graduating fellowship, I went to Vanderbilt University where I was faculty in the Department of Adult Neurology. And the cool thing there is Trauma Surgery actually runs their multidisciplinary TBI clinic there. And so they asked me.
To take part in that as a neurologist and so you know we had speech therapy, we had occupational therapy, physical therapy, pharmacy which was of great use on trauma

surgery attendings as well. So it was a really cool multidisciplinary clinic that I got to take part in and then just recently moved back to.

**Nila Escaname** 4:58
OK.

**Patel, Mayur H** 5:03
San Antonio and I have been here since September of 2024.
All right. So today we're going to talk about mild TBI and concussion. And so we have three separate types of traumatic brain injury. We have mild, moderate and severe. For from a nomenclature perspective, what a mild TBI is considered the same thing as a concussion. However, if they're trying.
To move away from the term concussion and now use mild TBI more so as a descriptor of the clinical injury. But for the course of this presentation, I'm going to say mild TBI and concussion are the same thing just to make it simpler. As we know you know a lot of people with concussion or mild TBI.
Tend to recover fairly quickly, and what I mean by fairly quickly is within a month. However, there are people that can't have persistent symptoms for months to years, and that can be very disabling for people. The one thing I will say, though, is that kids, for whatever reason, tend to get better quicker than adults do, and that's something that I've noticed.
In my practice as well, and I think one of the main reasons for that is that patients with pre-existing conditions like headaches, sleep abnormalities, mental health disorders tend to have a more prolonged course of recovery. And you can imagine why, because a lot of those symptoms are going to occur after you have a concussion, right? And so if you.
Have it.
Pre-existing history of something like this, that kind of makes you more prone to having an exacerbation of those symptoms. And so you know your adult patients, for those of you that do med peds or see adults are more likely to have some of these issues just by virtue of being older and having lived longer lives, right? They're more likely to.
Been diagnosed with like a headache syndrome, for instance. Symptoms can include a wide variety of issues, including somatic, cognitive, psychological and sleep disturbances. And I'm going to go a little bit into each of those and kind of my

approach to treatment.
And it's hopefully provide some insight into there. Within the pediatric population, sports related concussion are one is one of the biggest considerations that people need to take into account because that's fairly common, right? Kids of all ages are playing sports and you know you.
Whether it's football or, you know, even soccer or basketball, I've had figure skaters that have come in with concussions. You know, you can certainly have any kind of concussion, or you can certainly play any kind of sport and have a concussion. Just one little tidbit to throw in there from research.
So concussion is primarily A clinical diagnosis, but where our research is really looking at is are there biomarkers that can be shown not only to diagnose concussion but also predict future recovery. And so UCHL one and GFAP are two of them that have been studied so far.
The reason that they haven't really taken off yet is because a lot of our biomarkers that we're looking at are CSF or cerebral spinal fluid biomarkers, which makes it hard, right? Because you know, the way to get CSF is to do a lumbar puncture on someone, which is obviously very invasive, whether you're dealing with a child or an adult.
But now we're looking at blood biomarkers and there's some really big promise as to potentially using these in the future and then like an Uh setting, but also in an outpatient setting as well to show you know how well someone has recovered. So really exciting area of research though.
We're looking into.
Um, so as I mentioned earlier, there's three types of traumatic brain injury. We have mild, moderate and severe. Um. And that's, you know, this chart does a good job of separating out the three. Um, you are going to have some overlap between the three of them, right? You know, you may have someone who had.
GCS of 12 for instance, but had a loss of consciousness for less than 30 minutes and a non-focal neurologic exam otherwise. So there it can be some overlap, but they typically tend to fall more or less within these guidelines. What I typically see as a neurologist is more so the mild TBI.
Because a mild TBI is a going to oftentimes have fewer rehab needs and B they oftentimes deal with a lot of neurologic issues that can be more disabling and the vast majority of patients with TBI are also mild disorder. With moderate or severe you run into more of these issues where spasticity and rehab is a big need because.

These these patients have severe, severe deficits and rehab doctors do great job with those patients as well. So I'll typically defer those patients to rehab doctors, but more from my perspective where I can really add some insight is with mild TBI or concussion and that's kind of what I'll talk about today.
So for a long time, and you know, not even for a long time for now, actually diagnosing mild TBI and concussion is primarily A clinical diagnosis, but the American Congress of Rehab Medicine recently within the last few years released this.
Paper that helps you diagnose mild TBI through an algorithmic pathway. And so I'll go a little bit into that. A lot of this is self-explanatory and the paper is fantastic if you do want to look it up to help your practice in the future, but the specific, the specific criteria. So the first criteria.
Is there has to be a mechanism of injury that's plausible, right? And so, OK, someone got hit in the head. You know, someone's throwing a baseball and it happened to hit them in a. That's plausible, right? The other, well, it's not plausible. Someone falls down on their knees, trips and falls, but they land on their knees. There's no whiplash. There's no head in. There's no head in.
Impact, nothing like that. That's not really a plausible mechanism for a concussion, right? Then you have to kind of think of other causes. And then if you have that plausibility, most likely you can move down to the next criteria. And so criteria 2 is clinical science and that's a lot of in the moment stuff, right? And so.
That's where your history taking from loved ones that were there or EMS if they're coming in via the emergency route is very important because you know, a patient may not know that they lost consciousness immediately following the injury. They might not know if they were confused immediately following the injury. They may not know if they had.
Motor incoordination upon standing or seizure or other neurologic signs immediately following the injury. The complete or partial amnesia is something that they will know, but or that they can know. But the other signs, more or less I typically rely on either family members or EMS or some form of witnesses to.
Helpless that.
For criterion 3, which is acute symptoms, that's stuff that the patient will report to you, right? So an alteration in mental status, so some kind of cognitive difficulty that they're having or I guess that would be some kind of mental status difficulty they're having in the morning or in the moment, but then cognitive symptoms can also.

So be there physical symptoms, headache, nausea, dizziness. A lot of these are self-explanatory and symptoms that we do see with concussion. Criterion 4 is more so your objective findings, right? So you find cognitive impairment on exam when you do it, you find a balance impairment on exam when you test them.
You also can see oculomotor impairment. You can also and then the last part, the elevated blood biomarkers is something as I mentioned that they are looking into, but that could be something that they will also include as well.
The one caveat with this algorithm and one thing that they specifically mentioned is you have to use caution when employing this criteria, especially for young children, but also in individuals who have a pre-injury cognitive and or communication impairment. And so that's.
One thing to be careful about whenever employing this criteria, I as a neurologist, an adult neurologist, don't usually see children that young. It's a little bit outside my training, so I haven't run into that issue as much. But for the kids that I see that are usually above like 10 to 12 and older, typically.
Mostly teenagers. It's much easier for me to employ this criteria, but just kind of be cautious about this in your practice as per the recommendations of the study for very, very young children when employing this criteria.
But overall, this is a criteria that, you know, I myself, seeing mostly brain injury, do find very useful. As I mentioned, concussion and mild TBI has been primarily A clinical diagnosis for a long time, and so having something that we can work through from an algorithmic perspective has been.
Very, very useful.
So the meat of my presentation is going to be talking about the specific symptoms of concussion that I deal with and how my approach to them is. But just as a case example, the and this is a common finding that we see. So a 15 year old suffered A concussion during a game, didn't lose consciousness.
But hit and fell on his helmet. And again, as we were going back to that last slide, criteria one plausible mechanism of concussion, right? He was pulled from the game and taken to the Uh where they did a CAT scan, which was normal. And then over the next week he continued to have the symptoms, right? And so he had headache, dizziness, Vertigo.
Brain fog, irritability, insomnia. And so we're going to go into each of these symptoms as far as from an umbrella perspective and go into how the treatment algorithms and diagnosis can help these patients get better.

So as I mentioned, specific post concussive symptoms. These are the five that I see most often and they're pretty much copied over from the last side. But as I mentioned, headaches, so post-traumatic headaches, sleep difficulties, mood abnormalities, Vertigo and dizziness is included in that and then any kind of cognitive.
Difficulties. And so we'll go into each five of these and kind of show my approach to them. So we'll start with headaches. Headaches are out of all my traumatic brain injury patients that I see. Headaches are probably the most common. Now I probably have a little bit of a bias for this as I'm a neurologist.
And most of the time patients are being sent to me for headaches regardless. But I I do end up teasing out quite a bit of post-traumatic headaches when talking to patients and getting their history. It's one of the most commonly reported symptoms acutely following a mild TBI or concussion.
The diagnosis is important, so it's the onset of a new headache or worsening of a previous headache within seven days of trauma to the head. Personally speaking, I think that seven days is kind of a long time to be diagnosing this, and I've discussed this with other brain injury doctors as well through if someone.
Hits their head, you know, or suffers A concussion. They're probably going to have a post-traumatic headache within the first couple of days, right? From a definition perspective, the seven days is there, but in my experience, I typically see patients having these issues within two to three days.
After a trauma to the head and then it's persistent if the symptoms remain for greater than three months. Again, most patients get better within that time, but there are a few subset that do last longer. So talking about the new headache or worsening of a previous headache, again in a younger child, it's probably going to be the.
Onset of a new headache in teenagers, especially, especially young women may have already started developing headache syndromes such as migraines. And so that's something to keep in mind is if there's a young girl that has a migraine or bit or sorry, that has a.
Pre-existing history of migraine and then the headaches get worse, then that still counts because that's worsening of a pre-existing headache. So something to keep in mind in your older children. Headaches can be of any headache phenotype. So again, we have lots of different types of headaches.
Migraines and tension headaches do tend to be the most common. And then one thing that I've noticed that often happens is people have a cervicogenic headache at

times and think those will be people that have a lot of whiplash as a result of their accident. So think people that were involved in car accidents.
So even within your kids, it's always a good idea to check the cervical spine. And that doesn't necessarily mean image the cervical spine, but feel for points of tenderness along the back of their neck and along the musculature so often. And this may be more so in your older kids or your teenagers, you know.
On their phones all the time that their muscles start to tighten up in their neck because they're looking downwards, right? And so the way I explain it to parents and adults as well is that your head's obviously attached to your neck, which is attached to your shoulders, and so any kind of tightness in that region can pull on the muscles of the head.
And lead to referred pain. And so we call that a cervicogenic headache. And so if you've suffered whiplash before, if your patient has suffered whiplash, that's something to look into. Physical therapy works really well. Gentle stretching works well as well. For this, you can alternate ice and heat.
But that's something that I find that is ignored quite a lot in this patient population is looking at the neck and shoulder. So always look into that. And then as an adult, young girls tend to be affected more than young boys for whatever reason with regards to post-traumatic headache. But that does not mean that young boys can't develop post-traumatic headache, so.
Obviously something to try to keep in mind and look into.
So headache management, there unfortunately aren't very many studies into this. Non-pharmacologic, especially as I mentioned on that last slide for that cervicogenic headache with neck tightness is very helpful. You know, short course of physical therapy if they're dizzy and that's.
Their headaches. Vestibular therapy can help, and I'm gonna talk about vestibular therapy when we talk about Vertigo later, but just adding it as a placeholder for here. I'm gonna skip down to acute therapy because again in kids, they tend to recover better and better than adults or in quicker than adults, so you don't really.
If rarely ever get to the point where they need preventative therapy, but acute therapy is really nice because there's good evidence for alternating Tylenol and Motrin. So what we found is that in school age children, alternating acetaminophen and ibuprofen can help limit headache.
Days and then improve to school, return to school rate, which is important in this population. The one thing to be careful about is that the more that you take of these

medications, the more it can lead to rebound headaches. And we see that more so in our adult population in which someone is taking acetaminophen or ibuprofen around the clock. But if you've got a.
Child on it for, you know, weeks to months at a time, that is a consideration to keep in mind. So I typically say do it for about two weeks. Most should be better in two weeks, but if they're not better in two weeks doing that, then obviously we need to look into something else if there is a concern for migraine and again that would be within.
Pediatrics, that would be your older, older girls or teenagers. Then you can try low dose triptans. I'm not a big fan of prescriptions in this age population, so I try to avoid that if I can. I typically start with the alternating of the acetaminophen and the ibuprofen, but you can try that if needed.
Preventative. Again, this is going to be more so of a thing that you're going to do rarely. But my mantra as a physician, as a neurologist, is if you can treat multiple things with one medication, that's the route I try to go with. So as you can imagine within TBI, a lot of people have headaches.
They have mood abnormalities, they have sleep abnormalities, and so I really like amitriptyline a lot. It actually has very good evidence in post-traumatic headaches and can be used in pediatrics, primarily within patients above the age of 12. And the reason that I like that is that if you've ever heard that mantra, kill two birds with one stone.
Amitriptyline actually kills three birds with one stone potentially, which would treat potentially insomnia, potentially head pain and potentially mood disorder. It's an antidepressant, so it provides some. It can provide some benefit in all three and it's dosed once nightly QHS.
Which is nice as well. The primarily preventative treatments besides amitriptyline are typically medications that are used in migraines and so propranolol, topiramate are used as well. Again, in this age population, I'm not a big fan of starting Topamax or propranolol.
Unless someone, you know, badly needs it. So I try and avoid those if possible. Typically speaking, I'll try either melatonin, which has good evidence within pediatrics or amitriptyline. They tend to be tolerated a little bit better and work a little bit better. Again, that's just my anecdotal evidence, but that's simply what I go to to pyramid, even in adults.
Tends to have a lot of nasty side effects, so we try and avoid it. Propranolol is usable,

but with beta blockers, you know you have to monitor certain things, so that's makes it kind of tricky as well.
But that's typically by pattern for how I treat post-traumatic headaches. I typically will start with a non-pharmacologic and acute ibuprofen, Tylenol alternating within kids and then kind of escalate from there.
All right, so the next one is sleep. And so the time since injury plays a pretty large role. So within the first week or so after a concussion, kids will tend to have the biggest sleep issues and then it will progressively decrease up until about 3 months post injury.
There's a bidirectional relationship between sleep depression and deprivation and post concussion symptoms and that makes sense, right? And that if you're not sleeping well, your concussion symptoms are probably going to get worse and vice versa. If you what they found is that pre-injury sleep disturbances and older age at injury have.
Been shown to have an increased prevalence of sleep disturbance after pediatric MTBI. And so that was kind of what I mentioned earlier on is that pre-existing issues that patients have before a concussion can exacerbate the symptoms of concussion, especially if they're the same thing. So something to keep in mind.
They have trouble falling asleep and sleeping either more or less than usual, but drowsiness is actually the most commonly reported initial symptoms. So you'll have these kids that suffer head injury and all they want to do for the next 48 to 72 hours is sleep because their brain is just exhausted, right? I I give this example to my patients all the time.
Time and parents as well. And that whenever you suffer a concussion, it's almost feels as if your brain is running a mile a minute and it's just wearing itself out. And so rest is very important, especially in the acute setting. It's important to recognize poor sleep, especially in this population, as it can.
Cause difficulties with school and cognitive functioning and then also emotional and psychological well-being. One of my one of my fellowship directors, Carolyn Geist, is a physical medicine and rehab doctor at the University of Florida, and her mantra to treating concussion was actually treating sleep first and foremost because she found. Found that if patients sleep better, then they do a lot better at far as recovery. And so found a lot of benefit in learning how to treat sleep from her. And that's been helpful in my practice as well because you know, if we can get people sleeping faster again with that bidirectional relationship, it's shown improvement.

And then results. So treatments. Sleep hygiene is the biggest thing, right? So especially in your older kids that have phones and screens, it's great to sleep, but make sure you do not take this into bed. Do not exercise prior to going to bed.
If people have or kids, you know, adults, whatever have sleep issues that last for a long time, then cognitive behavioral therapy is very useful. And then last case is pharmacologic management, right. And so we talked about amitriptyline or melatonin, those are good. The one thing I didn't mention in amitriptyline is that.
It has an anticholinergic property to it, so it can have some cognitive slowing, but it's usually pretty tolerable, especially to low dose, and I don't find that to be too much of an issue. Trazodone is not really indicated in children. I just kept it in there and that you know if you can refer to a sleep doctor and they can try it, just be careful with.
Your adult or with your males as briapism is a rare but serious side effect. Sleep doctors aren't the biggest fans in the world of Trazodone, so as it can cause rebound insomnia, and it's not something you really want to use in a kid's population because it's not indicated under the age of 18. But.
I have seen it used before. Benzodiazepines absolutely avoid in any population, especially in children, but also in elderly adults as well. And then last but not least, if there it's not the insomnia issue, but it's the hypersomnia issue, then you can try. Setting a schedule, strategic naps, stimulants. I've actually seen quite a few teenagers that have had hypersomnia as an issue after concussion. And one of the biggest things that I've found that actually works for them is setting a schedule, right? And so you're gonna go and walk the dog at this time. You're gonna go hang out with friends at this time. You're gonna go to school from this time. You're gonna go. Study at this time, but and then you can finally go to bed and I think parents buy into that a lot as well. And that's something that I've seen that works really well for this population. And then obviously you can, you don't have to give them stimulants or anything like that. Cognition and so cognition is the third.
Third symptom that we're going to talk about and it can be very subtle, but within both Pediatrics and adults, attention and executive function tend to be the most affected and can be seen as long as three months after injury.
So within the sports population or with kids that are returning to play, we do the sports concussion assessment tools, **** 6, and that's like a full battery of tests that we do before prior to or before we can clear.
Child to return to play. And so the cool thing about that is, is that it's an objective

test, right? And they test their cognition, their balance, their symptom score. And then once they pass that, then they can go back to return to play.
The whole return to play protocol and we'll talk a little bit about that in the coming slides. And so this is actually a screen of the **** 5. They just updated it to the **** 6. I need to go and get a screenshot and update my slides, but it's it's a multi-page test that you can do in Office.
And so cognitive treatment, and we're going to talk about return to school in the next slide, is you treat the underlying cause, right? And this is more so within adults, but you can also see it with kids as well. Mood disorders following a concussion can lead to your cognition being slow, slowly or being slower than it was before.
But also coexisting headaches and sleep abnormalities, right? If you're not sleeping well, then your brain's not going to be at the full functioning. And that's what I'm trying to explain to parents also, but also headaches, right? If a patient is in pain all the time and that pain has not been treated, then that can also lower your cognitive reserve as well. And the important thing to tell parents is.
That this will get better once the underlying cause is retreated. For a long time, we used to tell people that when you have a concussion, you want to rest as much as possible and sit in a dark room. What our science is actually finding now is that that is bad for you the longer you do it. So the you know if there's one point you can. Take away from this thing is that in in most cases you should only cognitively rest for the 1st 24 to 48 hours. Prolonged rest has actually been associated with an increased recovery time. So after the 1st 24 to 48 hours, you want patients to typically start to return to their normal activities, right? And so whether that's.
Going outside, hanging out with friends within reason, right? And so if someone let's take an example for studying, right? And so if you have a child that wants to study, it's OK to let them start studying again after the first 48 hours, but you do it with breaks in between. And So what I'll tell people is.
Is OK, you can start doing your activity, start for about 10 or 15 minutes, see how you feel. If you feel like you're doing fine, then keep going. But at the first moment that you start to feel symptoms, that's a sign that you're overdoing it, right? So say you get to 20 minutes and you start feeling symptoms. That means that you need to take a break, go do something else, let your mind.
Recharge and then you can get back at it when you feel like you're ready to. And so slowly you'll be able to progressively. Patients will be slowly able to progressively increase their tolerance as time goes on. Return to school is a big thing, especially

within this population, and so it's common to have academic accommodations, and so I'll oftentimes write letters saying.
So and so would benefit from half days for a couple of days with increased return to work or return to school as tolerated increased time on tests, quizzes, homeworks. That's fairly common and schools will be willing to work with you on that. It is important to have good communication between the medical team and the school because the patient, you know if there's not a letter.
If there's not some form of communication, then the patient will be lost in between and the schools may not be used to dealing with kids that have had concussions, right? And so they'll be willing to work. They just kind of need some doctor guidance and letters. And so that's where we come in as clinicians.
So this is from the American Academy of Neurology and it's like and it's a graded return to school strategy. And so the first goal is to do daily activities at home that do not give the child symptoms. And so again, that's like reading, texting, screen time again.
Want to push for it, but as long as they're able to tolerate that, then you can gradually start to build up. And then we go to school activities and that was what I was talking about, the studying and how often, how long they're able to study and then you can go to school part-time and full-time and.
That typically works. You know your older children that may be working jobs. That's going to also be helpful for them as well and that you can write letters to employers kind of working with them as well. But as far as the graded return to school strategy, this is kind of my strategy that I follow and it I haven't had much pushback.
If any from schools at all on that.
All right. So we talked about headaches, sleep and cognition. Next we're going to talk about mood, and then last we'll talk about Vertigo and dizziness. So with mood, anxiety and depression are two of the most common mood disorders that you see following a mild TPI.
And they've actually now found studies that have shown a link between sustaining A concussion and having a risk of developing a new affective or behavioral disorder. And these can actually last pretty long. They've shown that you can develop the mood disorder up to four years after the injury, which to me seems very long, but. That's what different studies have shown important to recognize within these within children. They've done studies in children age 5 to 18 years that have children with a concussion have an increased risk of mental health visits, psychiatric hospitalizations

and self-harm. So that's something that's very, very important to recognize.
And your children when you're seeing them in clinic, as that can be something that's untreated and could potentially lead to issues down the line. So mood treatments. Again, I'm not a pediatric psychiatrist, so not not the biggest expert in the world in these, but again, kill two birds with one stone is my biggest thing, right?
So amitriptyline works really well. It's not the greatest antidepressant in the world, but for for concussion patients, it tends to do well because it treats other things which helps them feel better. And that's one of the things, you know, with mood disorders is that.
Kids and adults, you know that you're going to generally be sad because you don't feel well, right? And so if it helps treat the other symptoms, that in and of itself may help treat the mood disorders. SNRI venlafaxine is another one that I like, and you can use that in in Pediatrics as well.
37.5 milligrams once a day. It's nice because it has a little bit more of an activating effect, whereas the TCAS have more of a sedating effect, so you can kind of decide which one the patient needs more. Venlafaxine also helps with post-traumatic headaches and migraines as well as a preventative.
SSRIs are there as well. Mirtazapine is a nice drug in adults, but it's not as well studied in children. Lastly, therapy as well, right? So if someone had a, you know, cognitive behavioral therapy works well, this is, you know, beyond my scope as a neurologist, but psychiatry would probably be able to comment a little bit more on that.
But also talking to a therapist, especially if there's like a PTSD involved from a head injury that was something that was something very mentally traumatic for a patient, that can obviously help as well.
And then the last symptom that we're going to talk about is Vertigo. And so this is tougher within children because I find they have a little bit of a harder time explaining this, but it's important to differentiate true Vertigo, which is that classic spinning sensation versus lightheadedness. They say often overlap within patients, right? And so.
It's tricky within athletes and especially, you know, school age children that are sports related concussion. If they have dizziness or Vertigo, they've actually found that it's independently predictive of a prolonged recovery. So that's.
Something to keep in mind is that you want to treat the dizziness and vertigo sooner rather than later, because the sooner that you treat it, the quicker that they'll have a

chance as far as recovery and be able to return to their play faster. Vestibular dysfunction is something that I find is typically not taught very well.
Um, within neurology residencies and with medical schools. So you know, that's something that I enjoy teaching residents about. But the way I basically explain it is you have your peripheral vestibular system and you have your central vestibular system. Uh, your central vestibular system, kind of like your brain is or kind of like your central nervous system originates in the.
Brain. The peripheral vestibular system is the system that's far, far more often affected though, and you know your EMT's would probably be able to tell you a lot more about this. But basically you know your vestibular structures are inside on the inside of your ears on both sides.
And they can commonly be affected following a head injury. And that's, you know, probably because they're so prone to damage as a result of their location. And so they're very easy to be damaged as a result of trauma. And so vestibular dysfunction such as BPPV, benign pericysmal positional Vertigo is are the most common cause of. Post traumatic Vertigo and if you go back to your Med school studies, BPPV is that classic case in which someone wakes up in the morning or the test question I guess is when someone wakes up in the morning, turns their head to the side and then suddenly has spinning that lasts for about 30 to forty-five seconds because the crystals get displaced.
And so the Dix Hallpike is the test to kind of test for that and then the Epley is to fix that. One thing that I also think it's ignored or not looked into as much as ocular issues following vestibular following concussion, montraumatic brain injury.
And so ocular issues can be very disabling for people, just as disabling as headaches. And the biggest thing that I find is convergence insufficiency. So if you test it on your cell, if you put your finger out in front of you, you should see one. And then what I ask patients to do is slowly move it in towards their nose.
Until it double s. For me, it's about right here. And for most people that are normal, it should be under 10 centimeters. For people with traumatic brain injury or concussion, especially in the acute setting, it's far. It's typically much farther out, you know, it can even be 20-30 centimeters at time. So and the reason that that can be just.
Disabling is people don't realize how much your eyes have to converge to function on a day-to-day basis, right? Imagine you have a book or your phone in front of you. Your eyes have to converge to see that. So if you're getting diplopia or double vision

that far out, you're gonna get diplopia, you know, on something that's 510 centimeters away from your face.
And so that can be very disabling and double vision can lead to worsening of headaches. So that's something that certainly look into with regards to the slow pursuits, saccades and that stuff that goes in with the vestibular dysfunction rights. And so I'll put my finger out on this and just have them go side to side, keep your head straight and move.
Move your eyes side to side and that oftentimes brings out dizziness in these patients and that's a sign of vestibular dysfunction. And so for the convergence insufficiency, I find neuro ophthalmology is actually very, very helpful and you typically only find these at academic places and we have.
A great neurophthalmology team here at UT and what they'll do is they can do tests to help diagnose this convergence insufficiency, but they can also put like stick on prisms into the glasses so that a kid or adult with these issues is able to converge a lot better.
And so they don't even need to have a prescription for glasses. You can get just like the normal glasses without any refraction in them, but they can put prisms in them to help adjust it, which is nice. So treatment, vestibular rehab is a big component. We actually have a great vestibular rehab therapy.
Therapist here at the Mark, his name is Barry Morgan sent him a lot of patients and we've had great results. So vestibular rehab is basically a subset of physical therapy and they work primarily on issues with the vestibular system and so physical therapy works fantastic.
The furthest, if there is an lesion such as a dehiscence or a fistula, again very rare, but that can happen, then ENT is a great referral source for that. Vestibular migraine is a consideration, although more so in your adults.
That already have migraine compared to younger children and then medication. So meclizine is oftentimes prescribed by the Uh in patients that have dizziness and it works great in the short term setting. I would.
Recommend limiting it to more than or to children over the age of 12, not younger. But the one thing I would also recommend is avoid using this long term. Consistent use of meclizine has actually been shown to hinder central recovery, so.
Central vestibular recovery, right? So patients will feel better in the moment, which is fine if you're doing it short-term, but longer-term, it can actually slow down their central recovery. So something to keep in mind. Venlafaxine and gabapentin, just

these are more just anecdotal evidence of medications that I've tried that have had good recovery.
For your refractory vestibular syndrome patients that have still continued to have symptoms even after doing vestibular therapy.
So this is the Dick's Hall Bike and Epley or that's that's a picture of the Epley to for BPPV. Rare again in children, but it is within the realm of possibility and a physical physical therapy visit. The physical therapist will actually be able to.
Do the Dix Hall by and then they'll teach the They'll do the Epley as well there, but they'll also teach the family how to do the Epley so that the family can do it at home, which is nice if the symptoms reoccur. Lastly, I wanted to touch base on a special consideration of athletes, so a return to play.
Protocol is very, very paramount and what return to play is basically is it's a step wide ladder that patients have to climb in order to get back to full, right? And a physician has to be involved, either a neurologist like myself or a sports medicine doctor or a sports neurologist.
And basically what happens is if you remember we did, we showed the **** 6 earlier and so you'll see the patient in clinic and then once they pass and are back at baseline and pass their testing with the **** then.
The doctor will sign off and then it's in the hands of the school district and the trainer. And so the trainer will work them advancing every 24 hours from stage one all the way to stage 6. And the these stages vary based off the school district. This is just an example.
And if the patient is able to get through one stage without symptoms and are able to do well the rest of the day, 24 hours later, they can try to do the next stage. If they develop symptoms at that next stage, then they do not advance and they stay at that stage or go back until they're able to tolerate the symptoms.
Or tolerate this stage without doing the symptoms. The reason that this is important is second impact syndrome is a real thing. It's very, very rare, but it's rare as a result of athletes returning in a better manner than before.
But basically second impact syndrome is if a patient, you know it can be a child or an adult suffers a second concussion without having recovered from the first one, then that can lead to can be lead to this syndrome which is fatal and leads to cerebral swelling and can be very fatal. So again, I've never.
I've personally seen this before. It's extremely rare, but it is something to keep in mind. The retirement talk is something that comes up very often, especially within

younger populations. It's very individualized. It's doctor and patient specific and vary from athlete to athlete. This is one that I find to be, you know, very ethically challenging, right?
Right. Because if people were to ask, would you let your kids play football? My answer is no, right? As a neurologist, I know too much. But you know, you think about this from like a socioeconomic perspective. Imagine you have like this inner city child who's come from a financially disadvantaged background and this is the. Chance that they've got to make it big for themselves and their family. It's a very, very hard conversation to have because ethically speaking, you know you should do no harm, right? You should tell the patient. You should tell every patient. I think you should retire. But who am I to say that this is your one chance?
The.
Your biggest chance to make it big. Who am I to say that? No, you shouldn't. So, you know, ethically, that's something that I've found challenging. And the way I, you know, the way I reason it to myself is I I just have to be the objective person and tell the risks. And at the end of the day, you know, it's going to be a family's family's decision one way or another, right?

**Brooks, Edward G** 45:20
Well, if you're a kid from a inner city disadvantaged background, and this is your chance to make it big, I heard her say so.
I was wondering what he meant by that. I was saying, you know, I would tell him, don't, you know, don't play foot.

**Patel, Mayur H** 45:45
OK. So I was just sharing these two. Like I said, these are not financial disclosures. I didn't get paid for any of this or anything like that. This is just something that I did on a podcast I was invited to and something that you can share with your patients. They're both on YouTube.
The bottom one is probably more relevant to the Pediatrics and it was kind of talking about what I was talking about on the last slide as far as you know, the ethical quandaries of football and contact sports. And so we had a long discussion about that.

**Kamat, Deepak M** 46:16
I don't see any slides your PowerPoint somehow.

**Patel, Mayur H** 46:20
Is there not sharing? Let's see. Is it gone now or?

**Kamat, Deepak M** 46:26
Is it gone for everybody? At least for me, I don't see it.
Oh yeah, then others can see it. OK, something must be, must be my laptop, yeah.

**pat herndon** 46:33
Uh.

**Patel, Mayur H** 46:35
Others can still see it OK.
Yeah, no problem. OK. So yeah, like I said, this is, I didn't get paid for this, so not a financial disclosure or anything, but it's available on YouTube if you want to take a look that the bottom one was the one that I think may be more relevant to children and Pediatrics. And then lastly.
We have a multidisciplinary click. I heard that there's actually one that's been created for Pediatrics as well, which is fantastic news. But we're starting a new adult clinic at the Brain Health Building at UT. But I also see patients in the traditional outpatient setting at UT Health Days of Allah.
If there's a patient you'd like me to see, like I said, just by virtue of my training, you know, under the age of 10 to 12, it's, you know, probably not. I probably won't be able to help as much, but especially if there's like someone a little bit older or teenager or even, you know, potentially a little bit younger than that that you would like me to see, please feel free to reach out.
To me directly. That's my e-mail. I'm also available through Epic via both the UHS and UT Epic system, so you can direct message me as well. The middle initial is H as in Harry. I don't know if there's another micro Patel at UT, but if that comes up. But like I said, I'm happy to talk through.
with you guys. Hopefully this has been enlightening, but I'm happy to answer any questions that there may be.

**Kamat, Deepak M** 48:07
Thank you, Doctor Patel. There are some questions in the chat box. Do you differentiate pure post-traumatic headaches from my TBI?

**Patel, Mayur H** 48:18
Let me see. Sorry, let me read that real quick. You differentiate pure post dramatic headaches from my I I kind of put the two and two together. Just you know if there is a.
I'm trying to figure out how to word this. I mean because a post-traumatic headache could also occur from a moderate or a severe TBI as well. So I don't know if that's where the question's coming from. I I treat them the same way though, whether it's due to a mild versus moderate or severe TBI because again it you're the goal for the. Headaches for the post traumatic headaches is treating the underlying headache syndrome. So regardless of if it comes from a mild, moderate or severe TBI, I end up treating them the same way.

**Kamat, Deepak M** 49:04
There's another question in the chat box. I have. I have heard anecdotal evidence of baclofen helping short term. Do you think it is cervicogenic aspect of the headaches that is helping with?

**Patel, Mayur H** 49:19
Yeah. Oh yeah, I like Baclofen a lot. Tizanidine is another one that I like, but that's probably more so in adults as I think it can be quite sedating for children. I I like Baclofen. I typically will go to the physical therapy first just because it's a non pharmacologic route, especially if they're able to get in.
Quickly, but a low low dose Baclofen is certainly a reasonable option as well. And again, you know what we worry about is like the Tylenol ibuprofen causing rebound headaches. Excuse me, with Baclofen, it's not so much, not as much of an issue, which is nice. And again, you target the cervicogenic headaches.

**Kamat, Deepak M** 49:58
There is another question by Doctor Akbar. If the patient is already on a level for migraines prior to the concussion and after that has worsening of headaches and

insomnia, other than increasing the dose, do you add anything else?
Non triptanum can help sleep more and also any role of amantadine.

**Patel, Mayur H** 50:21

So good, great questions. Typically speaking, because I find that kids are on such low doses of amitriptyline, I'll probably increase it just a little bit. What you really worry about the anticholinergic effects of amitriptyline, which is, you know, weight gain and cognitive slowing is more so around 50.
Milligrams now in a child, you're probably not going to get to that high, but with an adult sometimes we get patients up to 50 milligrams and that can be tough because then you start to notice some of the side effects. Nortriptyline is is useful I actually find in my.
Or I guess what how we're taught as adults is nortriptyline actually doesn't help as much in sleep compared to amitriptyline. Again, that just may be what we're taught. But nortriptyline, if you're worried about the anticholinergic side effects, that's something that you could certainly switch amitriptyline over to. You may just not get as much of.
The, you know, the benefits of the sleep, but you'll certainly get the headache benefits as well. Orphenadrine. I haven't seen that used this much. I'd actually have to do more research into that because I haven't, I haven't prescribed that as much. Typically speaking, again in this population, the baclofen is the one I use the most. Tizanidine and cyclobenzaprine are available as well, but I hate using those in children just because of how sedating they are and we typically keep those with the adults.

**Kamat, Deepak M** 51:47

Thank you, Doctor Patel. Any other questions, comments for Doctor Patel?
I don't say anything. So, Doctor Patel, thank you very much for that wonderful presentation on concussion and how do you manage them in outpatient setting.
Thank you all for attending this morning's grand rounds. I'm going to conclude this morning's grand round. We'll see you.
We'll see you next Friday for another than. Thank you, Doctor Patel. Thank you all.

**Patel, Mayur H** 52:31

Thank you. I appreciate it.

**Williams, Janet F (Dr.)** 52:32

Thank you.

**Kamat, Deepak M** stopped transcription