

In Harm's Way: Traumatic Brain Injury in Young Children

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Video Link: <http://www.brainline.org/content/multimedia.php?id=2984>

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James F. Malec, PhD, ABPP: Kids of any type are vulnerable, again just because they're out there doing goofy stuff and things that adults would not do that put them in harms way in terms of getting a traumatic brain injury.

Wayne A. Gordon, PhD: Think about the child who falls in the playground and wakes up on the ground and nobody's there and then goes home crying. Think about the child who falls off the bike and gets dazed.

Jennie L. Ponsford, PhD, MAPsS: It may not become apparent that they have had a brain injury until they start to go to school for example and start to have some behavioral difficulties and learning difficulties at school.

Mark Pedrotty, PhD: I believe early diagnosis is crucial to a child's well being for the development so making sure that you don't just downplay just a bump on the head, it will be important.

Jennie L. Ponsford, PhD, MAPsS: Certainly there is clear evidence emerging that children injured in those vulnerable years between particularly the ages of one and in the early preschool years, are more vulnerable in terms of the long term consequences of the injury because of the implications for the development.

Steven Flanagan, MD: Infants often times just don't even do as well as other age populations with regards to recovery following traumatic brain injuries. So we all need to be vigilant in identifying that and of course preventing it before it even starts.

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Narrator: Headstart providers spend a significant amount of time with young children supervising, teaching, observing and interacting. Having such a dominant role in the lives of children in their care, they are likely to be more aware of the subtle and not so subtle changes in their cognition, personality, behavior and how well these changes correlate with expected developmental milestones.

Most traumatic brain injuries, or TBIs, are closed head injuries that can be mild, moderate or severe. Children with mild injuries often appear normal. More severe injuries can result

in coma. A traumatic brain injury of any severity can cause permanent neuropsychological changes. They can have a devastating impact on the remainder of a child's life.

James F. Malec, PhD, ABPP: Traumatic brain injury is an injury to the brain that results from basically the brain being rattled around inside the skull. And this can happen when you get hit very hard by something or you hit something very hard.

Steven Flanagan, MD: If you're matching the brain having the consistency of formed jell-o in the natural state, what happens is that your head gets jerked forward, the brain sort of compresses on itself as it gets jerked backwards, it stretches and if you think of what makes up the brain, a lot of nerve cells, it's those nerve cells that are being stretched and squeezed that are injured and can lead to problems.

Deborah M. Little, PhD: Traumatic brain injury is a really broad term. All we use it to indicate is a insult to the brain, which doesn't have to be direct, that results in an altered state of consciousness. That altered state of consciousness doesn't need to be a loss of consciousness. It can be a period of confusion. It can be a period of some mediate memory loss. And that, I think, probably one of the big challenges in treating this is it's not just people who lose consciousness but have a head injury.

Mark Pedrotty, PhD: The three typical ways, the most prevalent ways that children get brain injury, are basically falls because kids are at high risk. The toddlers are running around. They fall a lot. They trip downstairs and things like that. So falls is the number one way that kids get an injury. The second one is transportation accidents of some sort, kids in cars, kids on bikes, things that are moving vehicles. And the third way is assault. Kids are at high risk because they're vulnerable to being assaulted by other people, adults, caretakers. ADHD, those kids are always doing something. Kids and their hyper activity, impulsivity, they tend to do high risk activities. And they're at risk for a brain injury. But if they haven't had one, they are just at risk. Of the kids that go in the hospital with a brain injury, about 40% of them are between zero and four years of age.

Narrator: Of the four hundred thousand children a year who are brought into emergency rooms following injury to the head, twenty nine thousand are hospitalized and three thousand die. Often times, brain injuries are not well evaluated in the emergency department particularly when there are more life threatening injuries. Even if brain injuries receive attention in the ER, there is very little follow up on after care instructions, and a tendency of caregivers to assume there is no ongoing affect of the injury especially if the child appears to be normal. This means that many young children are not identified as having had a brain injury which can impact their development and their life.

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>> Importance of Early Identification and Effects of Delayed Diagnosis

Narrator: The brains and skulls of very young children differ from that of adults and even older children in mass, structure and consistency. Brain injuries in young children are complicated by the fact that their blood vessels are tender and nerve cells are not yet insulated with protective myelin making them especially vulnerable to injury. In addition, areas of the brain responsible for more advanced learning are not yet developed. And a brain injury may disrupt these processes and the emergence of higher abilities. TBIs can result in impairments in one or more areas such as cognition, language, speech, memory, attention, information processing, reasoning, later abstract thinking, judgment, problem solving, sensory, perceptual and motor abilities, cycle social behavior and physical functioning.

Mark Pedrotty, PhD: The dilemma with children is that early injury, when they are very young, causes very young children to be more devastated than a child who might be two, three, four years of age.

George P. Prigatano, PhD: Let's say they suffer from a contusion to their frontal lobes due to an automobile accident. And yet they look neurologically perfect. They look fine. And we give them all of the neuropsychological tests and for their age range, they're passing everything. And we say this is a miraculous recovery. No problems. No problems now.

Wayne A. Gordon, PhD: They may not emerge immediately because children grow into their injuries. In other words, as learning becomes more complex, as learning becomes more difficult, as learning takes more time, as learning requires more memory, as learning requires more organizational skills and the ability to abstract meaning from what you read and are told, it basically can begin to interact with your impairment.

Jennie L. Ponsford, PhD, MAPsS: The child is assumed to have some sort of a learning disability rather than the effects of a brain injury. And this is not an uncommon scenario.

Mark Pedrotty, PhD: That's why it's crucial to begin to identify brain injuries at a young age. So kids who might be skating through elementary school and they might be a little slower and things it might look like they just have a learning disability, might really have a brain injury that's silent. And as they get older then they're going to start failing in school and they're going to just be labeled as maybe a learning disabled or a bad kid or something like that. When really it's a frontal lobe injury that needs to be managed differently. Early identification allows you to try to compensate for kids deficits at that age if not develop the skills again so that they don't have long term problems.

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>> Failures in Identification

Wayne A. Gordon PhD: Many of these events in childhood just are not noted. And basically because of the lack of identification, it can then lead to misappropriate diagnosis. It can lead to misappropriate treatment. It can lead to misappropriate administration of medications, a whole host of things that are not good for the child.

Jennie L. Ponsford, PhD, MAPsS: There's been an assumption that some children with concussions are quite resilient and so I think many of them probably don't even make it to the doctor and certainly not the hospital. So this is one potential problem that they may be experiencing symptoms, especially in the early days or weeks because they're children, they're less able to articulate their symptoms and less able to understand them. So it's been fairly well shown that children do report fewer symptoms. And it's not necessarily the case that they're not experiencing them but it's possible that they're just not able to identify them clearly.

Narrator: Doctor Wayne Gordon of Mount Sinai School of Medicine has conducted notable research documenting lapses in identification of children with TBI in New York special education programs.

Wayne A. Gordon PhD: One of the things that we've found is that consistently over the five years of this grant, the interval between injury and when the kids were identified was five years. So for five years, these children were sitting in their classrooms not learning. For five years these kids were sitting in their classrooms more than likely failing.

Narrator: Doctor Gordon also found that 40% of young children referred into special education programs in the Denver school district had an unidentified TBI. Random screening of children in New York City schools revealed that even 10% of regular and gifted curriculum students had an unidentified TBI. Educating a child with TBI in a special ed setting is significantly more costly than in a regular class room that provides appropriate accommodations.

Wayne A. Gordon PhD: Right now there are six million children receiving special education in this country. According to the epidemiology of brain injury, we know that there should be five hundred thousand children identified in the schools who are receiving services as children with a TBI. There are only twenty four thousand children who have been identified with a TBI in this country. So that's less than 5% of what the number should be. So we're not doing enough in terms of identifying children.

In adults what we find is that you'll often find unidentified folks with TBI in all kinds of social programs or in psychiatric clinics. In children you will often see those kids with TBI mislabeled. So people are quick to use a label. So if it looks like an ADHD or attention deficit disorder, it's not necessarily an ADHD. Children with TBI sometimes have

attentional difficulties. But they also have memory problems. They also have executive function difficulties.

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>> Shaken Baby Syndrome and Normal Infant Crying

Narrator: Detection of TBIs of any severity in young children is more difficult since they usually cannot articulate their symptoms. This is particularly true in cases of shaken baby syndrome, also known as non-accidental trauma, abusive head trauma, traumatic brain injury, intentional brain injury. Abusive head trauma with impact, shaken baby syndrome with impact and shaken impact syndrome. Children who are high cryers are at a higher risk for being shaken. Yet research indicates that long bouts of infant crying is normal in human and other animal species and may even be necessary for normal neurological development.

Marilyn Barr: The onset is approximately two weeks. The peak is in the second month of life. And it subsides more or less by four or five months. And during that time period, babies can cry a lot or a little depending on the baby and they can cry as much as five or six hours a day and still be perfectly normal. When a baby is going through one of these crying bouts, parents sleep deprived and frustrated can pick up their baby and just feel so anxious and angry even at a time that they just shake their baby. Now if it was a very serious hard shake, the baby would be symptomatic almost immediately. But in what we refer to as a milder shake, it can stun the baby and give them a small concussion and quiet them down. And the feedback or the impression the parent has is that this worked.

Narrator: Infants and toddlers are highly susceptible to abusive or non accidental head trauma due to the disproportionate size of the head relative to the child's body. Even a mild shake or one of relatively short duration can have a devastating impact on a child's brain and neurological development.

Marilyn Barr: Unfortunately in some of the cases that we're aware of, parents contend to want to wait and hope that the baby gets better and that there's something else wrong. And they'll put them back in their bed or they'll wait and see and it's critically important to get medical attention and help immediately.

Of the babies that are shaken, 20 to 30% die. And those that survive, as much as 80% have life long disabilities, some sort of brain injury that is life long. So this is a very serious situation. The outcomes from shaking baby syndrome, or shaking a baby, can range anywhere from mild to moderate to very severe. And in the cases that are what we would call more of a milder shake, the result can be learning disability's subtle, behavioral changes later in life, vision problems, hearing problems, anything that the brain controls can be, in a way, moderately affected. And that range can go all the way to in the more serious shakes where a baby's shaken very hard and a lot of brain damage is done and damage done from

that shaking that they initially, are in a coma possibly and seizures and later in life can be so severely brain damaged that they actually have to be cared for, for the rest of their life and often times die at earlier age.

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>> Common Signs and Symptoms of Traumatic Brain Injury in Young Children

Narrator: There are a number of symptoms that can result from a traumatic brain injury. Depending on the area of the brain that was impacted. Even a seemingly mild injury can result in physical, cognitive and emotional or behavioral changes in a child. The obvious signs that should alert a caregiver of possible brain injury, include cuts and bruises to the head, bleeding that doesn't stop, extended drowsiness, lethargy, loss on consciousness or a child that can not be aroused , repeated vomiting, choking or seizures. Other physical indicators include loss of balance or coordination, changes in responsiveness, unequal pupil size, eye tracking problems, loss of previous motor function, loss of grasping function, reductions in muscle strength, light or auditory sensitivity, general sensory impairments including changes in vision, hearing, taste or smell and or complaints of headache or fatigue.

Emotional behavioral changes may include extreme irritability, depression, anxiety, increased fidgetiness, low tolerance for frustration, inability to deal with unexpected events, moodiness, impulsivity, aggressiveness, changes in sleeping or appetite. Cognitive changes may include a decline in language, word finding difficulties, trouble paying attention and staying focused, changes in speed of processing, difficulty learning and remembering new information, or integrating new and old learning and difficulty planning and following through with tasks.

Other signs and symptoms can be more subtle and children may appear quite normal. Parents and caregivers may minimize the effects of a concussion. Some symptoms may be immediately apparent following an injury while others, due to secondary effects or of developmental masking, may be delayed on their onset and therefore not related to a previous injury. In the case of accidents, or abusive head trauma, the more life threatening injuries receive the focus of attention and the effect of a head injury may be overlooked.

Wayne A. Gordon, PhD: If there was nobody there observing the event then you're left with interpreting signs.

Mark Pedrotty, PhD: When our kids bump their heads and things, we just kind of think that they're fine and move on. Obviously it can begin to look like they're just sick. They can be throwing up and vomiting. It could look like they're just overtired because they're irritable. In families where there are divorces or a trauma going on in the family or some

sort of stress, it could be these kids are just irritable, they're not sleeping well or they're sleeping too much.

Wayne A. Gordon, PhD: What you're with saying is, ok the child I'm seeing today is different from the child I saw in my day care program or my nursery school classroom yesterday.

Marilyn Barr: Oftentimes, most likely, they aren't doing the normal things they were doing before. For example, the developmental milestones that they had previously been doing like rolling over and reaching for things, tracking with their eyes, some of those things have changed even a little bit. But you note that there's some differences in this baby. Could be some of the first indications that this baby may have some brain damage.

David A. Hovda, PhD: Does the baby focus on visual stimulation? Can you move your hands and does the baby follow something? Does the child suckle correctly? Does the child eat correctly? Does it have a normal orating response? If it was walking before, can it now walk still? If it has, can it roll? Can it right itself, if it's an infant? If it's talkative, can it tell you that it has a headache? Or if it can't talk, but just cries all the time, does it seem like it's got constant crying? Are the pupils dilated? Do the pupils constrict the proper way? All of those are signs, that if you get a positive sign you have an infant, or a young individual that has had a head injury.

Marilyn Barr: In the more serious cases when a baby has been shaken, there can be some pretty dramatic kinds of symptoms and those things can include that the baby is in a coma or the baby is seizing. They can have all kinds of problems like they aren't moving hardly at all or their breathing is very shallow. The part of the brain that controls the breathing starts to shut down and so if you hardly see the chest moving, these are all signs that the baby needs medical attention immediately, important to get the baby to the hospital or call 911 immediately.

Narrator: It is important that providers use caution and proper judgment before alarming parents about possible brain injury or in holding them accountable when there is concern about relatively non specific symptoms such as fatigue, irritability, depression or in incidence of vomiting. Oftentimes these symptoms, in the absence of other TBI related cognitive symptoms or developmental regressions, are the result of short term illness and do not necessarily mean that a child has sustained a traumatic brain injury. Currently, there are no good screening tools for evaluating TBI in young children. To further improve their ability to identify children with TBI, providers are encouraged to explore website resources and check lists for the Centers for Disease Control and the Brain Injury Association of America.

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>> Addressing Undiagnosed but Suspected TBI

Narrator: In cases where an injury to the head is observed, it is important to document the event in addition to reporting it to a supervisor and the parents. Routine documentation of incidents, which include a thorough description of individual events, as well as a child's reactions will be helpful in charting head injuries. This information will assist medical professionals in making a diagnosis of brain injury and guiding its treatment.

George P. Prigatano, PhD: So in diagnosing children and adults that have mild traumatic brain injury, a key issue is the history. If you don't have a good history, it's very difficult to make some final decisions.

David A, Hovda PhD: How was the head moved? Was it moved violently from side to side? Did the head hit the ground? Did they hit something else? Did they have a helmet? How was it moved? Because that will help us to understand a lot of what to look for in terms of a neuropsychological assessments in the future and maybe imaging.

Mark Pedrotty, PhD: If a child is laying there unconscious for an extended period of time, say more than a minute, I would be going to the ER with that child. I wouldn't go to the PCP. If the child has an injury beyond just a cut that needs a few stitches, I'd be going to the ER.

Marilyn Barr: Certainly if the baby is turning blue or in a coma or seizing you'll want to call 911 immediately.

Narrator: The American Academy of Pediatrics recommends closely monitoring a child for twenty four to forty eight hours and up to several days after a head injury. Although the child may seem normal or complain of a headache, there may be a slow bleed within the brain or under the skull which over time can increase pressure within the brain.

If untreated, these complications can be life threatening or result in permanent disabilities. If the child's condition worsens at anytime during the interval of observation, parents, guardians or caregivers should seek immediate medical attention. If a traumatic brain injury was not observed but is suspected, it's important to document observations, notify parents of these changes and ask questions that would establish a history of head injury. Did anything happen that might have caused a blow to the head? Was there a car accident, a fall off of bed, playground equipment or downstairs, a fight with a playmate or a sibling? Was there any incident that lead to a disruption in consciousness or period of confusion?

Mark Pedrotty, PhD: Two is one of the huge milestones for language development. And if you're not seeing language develop at that time, then there needs to be an evaluation done. It's difficult sometimes to question parents but if you question them in a way that is trying to understand how best to help their child and make sure the child gets the needs

that's best for them, then you can work with the parent instead of work against the parent.

Parents will either tell you exactly what happened or most cases, they'll say they fell off of the bed, they were climbing on something and they fell. So at least the report begins to have what's called a paper trail. And that paper trail then helps you begin to piece together whether or not a crime has occurred or whether or not there's more need for more severe interventions.

Marilyn Barr: It's very important to document these things and make the information available to the parents and suggest that they probably need to have the baby checked out by a medical provider. If these conditions persist over a period of time or even get worse and can result in a life threatening kind of situation, it's time to take it to a different level and call medical authorities or someone at a higher level.

Narrator: In cases of non accidental trauma, it is essential to follow the reporting requirements set forth by your Headstart facility and state child protection agency to assure the safety of the child and avoid placement back into a situation where additional harm can occur.

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>> Addressing Known TBIs

Narrator: Brain injury may not be adequately addressed in emergency rooms. And milder TBIs may not show up on standard neuroimaging such as CT or MRI. Children diagnosed with or suspected of having a traumatic brain injury should be referred to a neurophysiologist or other trained professional for evaluation. These evaluations can differentiate between a child who has a TBI and one who has an ADHD. Headstart providers should follow up on these evaluations.

Mark Pedrotty, PhD: One of the things I find is that parents are worried that their children are going to get mislabeled. And that that label is going to stick for the rest of their child's life and that will cause a disability. And what I counsel on and encourage parents to do is to make sure that the school does adequate testing, to make sure that the school follows up on testing every year or every two years and always revisit the diagnosis because certainly once you've had a brain injury, you've always had a brain injury. But just because you have the brain injury doesn't mean you have to be disabled. And it's essential that parents realize that labels don't have to follow their children throughout school. Finding out where a child is in re-entry into school from the injury is essential to figuring out a child's stamina. If a child has a brain injury and maybe they're on a stimulant and it helps them to be able to focus and pay attention in school for four hours instead of two hours that's good. If they start getting headaches, they start getting tired and fatigued, they

get irritable, they might get silly and giddy, then they might start getting in trouble. So we have to see if the schools are adapting to their stamina and their level of stimulation they can have.

Narrator: Most children will quickly recover from a mild traumatic brain injury or concussion. Some may experience dizziness, memory problems, fatigue or other symptoms for a few weeks to months after their injury. Children with moderate to severe brain injuries may need specialized programs that consider the specific needs assessed in the neuropsychological evaluation.

Mark Pedrotty, PhD: For the kids that have the mild to moderate brain injury, and the medication and the rehab has been helpful and say they've had three months off from school, they can do fine in regular classrooms as long as they have some sort of 504 plan in place that addresses the specific parts of their injury.

Narrator: Brain injuries may compromise attention, memory and processing speed. Children with brain injury may require information to be repeated several times. They may require more time to do their work or adjustments in their learning modality. Computers and other assistive devices are often prescribed as part of their therapeutic regimen.

Mark Pedrotty, PhD: The other one is helping these kids, depending on what's is going on, is being able to better understand what other kids are doing. At that age kids tend to do parallel play and then they develop some other play where there's some rules that are involved as they're getting a little older. So the kids might need help from the adults to begin to understand what's going on around them and to get along better with the other kids. And vice versa, the other kids might need some help to maybe slow down a little bit or repeat things with them. And again, it all just depends. Then there's fine motor skills and gross motor skill developments so these kids might need a little bit more help with fine motor skills, they might need the bigger crayons longer, they might need to have scissors and some help with one over that's called hand over hand, help to do some things just so that they begin to get the skills that they need. By training, and by doing activities over and over again , the repetition begins to help the brain recover and do the things it needs to be doing.

Narrator: A child who had sustained a traumatic brain injury of any severity has an increased likelihood of sustaining additional brain injuries. Providers who are caring for a child with a known or diagnosed TBI will want to be extra cautious in observing and protecting that child in order to prevent exposure to repeated insults. Children with milder injuries who are expected to improve should not be allowed to engage in normal activities until receiving physician approval.

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>> Prevention

Mark Pedrotty, PhD: Children are wonderful beings. They're fun. They love everybody. They're open to the world. They play so freely. They're curious. And it's that curiosity and that ability to play that allows them to grow. The flip side of that is kids have bad judgment. They don't understand what safety is and they need constant supervision in an enriched environment to maximize how they're going to do.

Diana Read: My belief is that prevention is the only cure for any brain injury because once it's occurred, you have that occurrence of it. It's happened. And so if you can prevent it all costs, please do.

Mark Pedrotty, PhD: With brain injury, you really have to make sure that you don't have secondary and third artrituary [assumed spelling] injuries. You really have to watch what you're doing. You're at a higher risk once you've had one brain injury. A kid who's had a brain injury really needs to slow down and pay attention better to what they're doing. Headstart is a wonderful program and it's crucial for kids with brain injury to be involved in. So if they know that a child has had a brain injury, then Headstart can do just some very simple things like keep an eye on making sure that safety is clearly established.

Diana Read: A number of ways of prevention include falls for young children from playground equipment. Prevention of that would be proper surfacing underneath playground equipment. You don't have young children close to swings when they're coming off of slides. So there's all types of playground issues that can reduce brain injury or prevent it from happening. Another major area for prevention that I particularly believe in is the proper car seats for children. And for Headstart providers, they're at the right age to encourage booster seat use for children.

Narrator: Helmet use is another critically important safety measure for children of any age. The New Mexico child helmet safety law is one of the most comprehensive in the nation. It specifies that children and youth under the age of eighteen years of age are required by law to wear a helmet when using bicycles, tricycles, skateboards, scooters or skates on public property. An appropriately sized helmet is encouraged when using any non motorized wheeled vehicles as well as ATVs, skis, snowboards and while riding horses.

Diana Read: Ensure that your windows have window guards on them or proper screens or that they're locked when children are unsupervised. But that brings up another point, I believe in supervision in children and I believe in active supervision. And what I mean by active supervision is the fact that you know where they are, what they're doing at all times. You are not just assuming that they're safe.

Another issue for children and reducing the chances of them falling would be using safety gates. And not just at the top of stairs but also at the bottom of the stairs because children like to be adventuresome. They like to explore. They love to challenge their bodies physically. And so if you don't reduce that chance that they're going to go up the stairs and fall rather than just reducing the chance of them falling down the stairs, so please be sure to use safety gates both at the top and the bottom of the stairs.

Steven Flanagan, MD: If a child does have a traumatic brain injury of any severity early on, even if it appears as though they've have had a good recovery, be cautious.

Mark Pedrotty, PhD: Early identification allows you to try to compensate for kids deficits at that age if not develop the skills again so that they don't have to have long term problems.

Steven Flanagan, MD: It's also very important to recognize that if they don't make that full recovery early on, that we are providing the appropriate educational services for those children early on to make sure that they can keep up as best as they can.

Mark Pedrotty, PhD: You know that people who've had an injury years ago and now are getting rehab that their brain changes. You talk to people with a brain injury and they'll tell you I keep getting better. This is getting better for me. I'm getting new skills.

Jennie L. Ponsford, PhD, MAPsS: Certainly, in terms of information for families to understand what might be the signs of the child having difficulty, how to manage behavior changes, but above all, doing early interventions, facilitating their language development, providing support at school so that they can learn is extremely important.

Mark Pedrotty, PhD: You just have to be patient because we see kids do things that are considered to be miracles at this point.

Narrator: Children present some of the toughest challenges to detection and diagnosis of traumatic brain injury since they are often unable to articulate their symptoms and injuries can affect skill sets that have yet to develop. Accurate documentation of changes in function and behavior are imperative when TBI is suspected in a child. Careful documentation can help medical professionals make an accurate diagnosis to prevent inappropriate treatment and help the child receive proper care. In the case of abusive head trauma, careful documentation may prevent further injury and even death. Headstart providers are in a perfect position to observe changes in behavior in children that could be an indication of TBI. Working with parents and medical professionals, providers can help a child with an identified TBI cope with their injury and thereby avoid permanent disability. Adjust the pace of learning and the attainment of new skills. And most importantly, improve recovery outcome for the child.

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