

NICHD Research Perspectives Audio Podcast

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Announcer: From the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, part of the National Institutes of Health, welcome to another installment of *NICHD Research Perspectives*. Your host is the Director of the NICHD, Dr. Alan Guttmacher.

Dr. Alan Guttmacher: Hello, I'm Alan Guttmacher. Thanks for joining us for another in our monthly series of podcasts from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development at the National Institutes of Health.

In recognition of April being National Child Abuse Prevention Month, we will be talking today about what the research community refers to as abusive head trauma, which the general public usually knows as shaken baby syndrome. By either name, we're describing injuries resulting from a kind of child abuse. Shaken baby syndrome may result when someone shakes an infant out of frustration, perhaps to get him or her to stop crying, or when the infant is thrown, struck, or slammed against a hard surface. Of course, this does not include gentle bouncing or other playful activity that is actually important to healthy child development. Even though the caregiver often does not intend to harm the baby, shaken baby syndrome is a serious form of abuse.

Newborns and infants in the first months of life are at greatest risk because they cry longer and more frequently than do older children. To understand what happens during an episode of strong shaking, it's helpful to understand some basic anatomy. The brain is not fixed inside the skull, but is a soft, sensitive mass of tissue floating within a cushioning layer of fluid. The skull can partially shield the brain from a blow or other impact to the head. However, it cannot prevent the brain from moving inside the skull.

Infants' heads are larger, in proportion to their bodies, than are adults' heads. Also, infants' neck muscles and ligaments are much weaker than those of adults. When an infant or toddler is severely shaken, the brain bounces back and forth against the skull. This is a type of whiplash,

similar to what can occur in an automobile accident. It bruises the infant's brain tissue, causing the brain to bleed, swell, and press against the inside of the skull. If this pressure is not relieved, it can cause more injury to the brain. The shaking may also tear the large blood vessels along the outer layer of the brain, which can lead to bleeding, swelling, and increased pressure on the brain. Babies who are shaken violently can die from this kind of incident.

Of course, head injury also can result from a blow to an infant's head, which can fracture the skull, or cause brain bleeding and swelling. Like severe shaking, such impacts to the head can lead to permanent brain damage or death.

Our guests today are involved in research to better understand the factors contributing to this form of abuse, to prevent pediatric abusive head trauma from occurring, and to help those infants who have suffered it.

Dr. Valerie Maholmes is the Acting Chief of the Pediatric Trauma and Critical Illness Branch at NICHD. She also manages our Child and Family Processes/Child Maltreatment and Violence Research Program. Our two other guests are grantees of the NIH, who receive NIH funding to conduct research on infant and child abuse. Dr. Cindy Christian is an attending physician at the Children's Hospital of Philadelphia, where she directs the hospital's Safe Place: The Center for Child Protection and Health. She is also a professor of pediatrics at the University of Pennsylvania School of Medicine. Dr. Mary Clyde Pierce is an attending physician at the Ann & Robert H. Lurie Children's Hospital of Chicago and is an associate professor at Northwestern University's Feinberg School of Medicine. Drs. Christian and Pierce have been working with Dr. Maholmes to plan a scientific conference on pediatric abusive of head trauma that will be held on May 22nd and 23rd of this year. The conferees will review the medical literature on pediatric abuse of head trauma and seek to identify opportunities for future research—ways to identify those infants most at risk, to prevent such abuse from occurring, and to help those who have been injured.

Dr. Guttmacher: Our first guest today is Dr. Valerie Maholmes. Valerie, there is still a lot we do not know about shaken baby syndrome or, as the research community calls it, abusive head trauma. It's often difficult for a physician even to make the diagnosis, isn't it? For example, an injured infant may arrive at a doctor's office or hospital without any visible sign of physical

injury. And the symptoms the infant may have, like lethargy or loss of appetite, might be explained away as something less serious, like a cold or an intestinal illness. Valerie, can you tell us something about why NICHD is planning this meeting and what you hope to learn from it about such questions.

Dr. Valerie Maholmes: Yes, and in fact what the issues you raised are exactly what we want to address at this meeting. This will be a continuation of the 2002 meeting that we held here at the NIH, and we called it inflicted neurotrauma at that time, and we brought together researchers from a variety of disciplines to talk about what was known at that time, and a monograph was published by the American Academy of Pediatrics. Since that meeting, we've wanted to know where the science is headed, where the opportunities are to make a contribution, so we are looking at what is known, given the advances in the science since that time, and also what is still unknown, and where contributions in basic biomedical and behavioral science research, clinical practice, and policy are needed. We'll have a diverse group of researchers attending this meeting from various disciplines, including neuroscience, neurotrauma, neurosurgery, radiology, ophthalmology, psychology, and clinical practice, and we are bringing them all together to answer these questions collectively to talk across disciplines so that we can focus our efforts on a research agenda that might help us understand more fully the issues and challenges of abusive head trauma. And this will be the inaugural conference of our newly established branch, and we're hoping that the proceedings from this meeting will advise us about future directions for research for this branch.

Dr. Guttmacher: Thank you, Valerie. That's very helpful context. Our second guest, Dr. Cindy Christian, is involved in research to better understand shaken baby syndrome. Dr. Christian, we know that even a few seconds of shaking or one blow to an infant's head can cause irreversible brain damage or even death. For those infants who survive, what are some of the health problems that can occur and how do you treat them?

Dr. Cindy Christian: Well, first let me thank you for having us and for highlighting this really public health problem; child maltreatment is—we like to think of it as really a public health problem that we need to solve really as a community. It is really tragic when we see children who are victims of abusive head trauma or shaken baby syndrome come in to our pediatric

intensive care units and hospitals around the country because we look at infants who, for the most part, have been healthy babies, who have their whole life ahead of them, and because of social circumstances and frustrations by the adults caring for them, often end up with permanent brain injuries that do affect the remainder of their lives. In our most severe cases in children who don't die of their injuries, some children are left with permanent severe neurological damage. So we have children who have chronic developmental disabilities, children who have developed seizure disorders, who become blind, who have hearing deficits, who have cerebral palsy and other motor disabilities because of the brain damage that they sustained. Even children who seem to be doing well after an episode of shaken baby syndrome or head trauma, when we look at them as they get older, they often will have some subtle cognitive delays, so they may be children who have learning disabilities, children who have behavioral problems. And so even for those children who seem to have less severe, in the way of neurological outcome, they still are at significant and high risk for developmental disabilities as they go through childhood.

Dr. Guttmacher: Cindy, do we know what factors increase the likelihood of abuse of an infant by a parent or other caregiver? Is there a particular personality type that's most at risk for committing this kind of violence? Are there clues parents should look for in a caregiver or spouse or even in themselves?

Dr. Christian: So there are some things that we do know. But let me start by saying that there is really no particular personality type that's at risk. We all are at risk, and I think that it would be unfair of us to think that none of us can get frustrated by a crying baby, you know, in many, many of the cases that I reviewed over many years, the instigator of this kind of abuse is very commonly a crying baby. And we've all been frustrated by babies who are just crying, but most of us have the social support, we have some knowledge, we have self-control that we don't take these frustrations out on our really helpless young infants. But there are individuals, who because of what's going on and the stress that they have in their lives and the lack of social supports and their self-esteem and sometimes their lack of knowledge, they do take these frustrations out on babies. We do know from repeated studies that the majority of perpetrators of abusive head trauma are men, but we use that really in terms of thinking about prevention, not in identifying in any individual case who a perpetrator is because women can harm children just as well as men.

We also know from literature that one of the strong risk factors is having an unrelated adult living in a household, and so in my experience, we have many cases where a young mother, or a mother of a young baby, has a boyfriend living in the house. The boyfriend may not be biologically related to the child, and often when that young man is left in a caregiving role for that child, sometimes bad things happen. So those kinds of risk factors help us to hopefully target some prevention efforts and help us to think about prevention, but in my mind, really, any adult who is tired and stressed, who is dealing with an irritable crying baby, is at risk.

Dr. Guttmacher: Dr. Christian, as you appropriately point out, indeed any parent or caregiver can find it very challenging to deal with a crying baby who is inconsolable. Do you have any advice on how to deal with one's feelings at such times?

Dr. Christian: Sure, I think the first thing to always know is that crying in a young baby is often normal; it's part of their neurological development. And as pediatricians, we teach parents that if you know the baby has been fed, you know the baby is not sick, you know the baby is clean, you know the baby is not injured or hurt, then it's okay to put the baby down if the baby is crying because that baby is simply at the time of the day where they do cry a lot. And I always say that I don't know any baby who ever kind of cried themselves to death, but I do know of too many cases where parents got frustrated by the crying of the baby and we ended up in a really quite terrible situation. So the first thing is that we, as pediatricians, always want parents to have a support system. So if you are the primary caregiver and you've kind of reached your end, it's always appropriate to say to a partner, to say to a grandparent, a support person, somebody who you trust, "Can you take over because I've had enough of the crying baby?" And it's also perfectly fine to take a crying baby and put them in a nice safe sleep environment like a crib and walk away and calm yourself down, do something that relaxes you, that rejuvenates you so that you don't get frustrated with this crying baby.

Dr. Guttmacher: Thank you, Dr. Christian for those very helpful, I think, suggestions for all of us who take care of infants. Our third guest, Dr. Mary Clyde Pierce, specializes in research that helps physicians distinguish between a fall or other common childhood mishap and an abusive event. From her research, we know that injury from child abuse tends to be ongoing—a

continuum of really a series of events. Often, it starts with small injuries, and then gradually escalates to more severe injuries, and perhaps ultimately ends with the death of a child. At one end of the spectrum, you might see some fairly minor bruising, and then some time later, something truly horrific. So, seemingly minor injuries may be a harbinger of a very severe and unfortunate event. I'll ask Dr. Pierce to explain more about this to us. Also, do you have any advice for our listeners—whether they're physicians or parents or just concerned bystanders? What might they be on the lookout for? And what might they want to report to police or other authorities?

Dr. Mary Pierce: Yes, thank you very much for having us. What's interesting about child abuse is that, especially these really young babies and these young children, at first, specially at first 3 or 4 years of life, often, before they have a fatal or near fatal event, they really were warning signs that were present or somebody noticed something or somebody had a concern but they really didn't speak up, or they didn't want to get involved, or they didn't want to cause problems. But when we look back, because looking back often teaches us how to predict or how to do a better job going forward, we often see that there were things that were missed. One of the most interesting and important things that I found by doing research from an emergency medicine point of view is that often children have very subtle early warning signs that they are being physically harmed or physically assaulted, and one of the most common things that was overlooked was actually bruises. I think bruises are easily overlooked because we're used to everybody bruising, but infants actually don't bruise and they don't bruise easily. And in these younger children, when they do have these unusual bruises—I call them atypical bruising—they are actually more consistent with being physically assaulted than they are from just fun accidental kinds of injuries that children get when they start developmentally fun things. So paying attention to these little injuries, and these subtle injuries can actually make a huge difference. The big mistake I think people make is that they think that if the injury is minor that the risk is minor. That's a huge mistake that I see both in medicine, social work, and our legal system. In fact, these injuries can be the harbinger that something bad is about to happen or that the child is actually in a high-risk environment. So warning signs of a high-risk environment might be something as little as just a little bruise on an infant, like a 2-month-old infant, or it can be something like an ear bruise on a 2-year-old that doesn't have a clear explainable reason for it.

Other things that have been interesting as we've looked across many, many cases, both doing cases and controls, we found that the negative attitude toward the child or derogatory feelings about the child really put that child at risk and I think of it as the child's environment not just that one caregiver but maybe the mom's boyfriend or the father or anybody that's in that child's life, that's that child's environment and those are the people that can actually really cause a lot of harm to the child and prevent them from growing up and really having a full life. So negative feelings about that child, negative interpretations of the child's actions are just unbelievable things, like even 2-month-olds, people thinking that the baby is crying to get on their nerves trying to get control, trying to manipulate. So this set of negative attributions about the child's behavior really are indicators that that child is at risk and there are things that if we, going forward, can pay attention to we might very well be able to actually prevent some of these catastrophic things that are happening to these young children.

Dr. Guttmacher: Dr. Pierce, you've examined early injuries and psychosocial factors in young children. I know that by looking closely, you've learned about clues that may indicate whether the child is at risk for future, truly devastating injuries. What are some of these clues and how effective are they in predicting future abuse?

Dr. Pierce: What is interesting is that we've done a couple of studies now where we've looked back, and in at least half of the cases there are early warning signs—specifically, one of them was actually bruises on an infant where that was unexplained or they weren't in a car crash or something like that, or atypical bruises, like on the belly or on the ears where they didn't really have a clear explanation or they offered a very soft explanation for what happened. And then they ended up having a catastrophic injury when an intervention, when the proper intervention didn't occur. So those are really very valuable clues. In fact, in two different studies we've done now, over half of the children that actually ended up with fatal or near fatal abusive head trauma ended up having early warning signs and one of the most common early warning signs that was overlooked was actually this atypical bruising. So I think that teaching people that these early signs of injury, I call them surface injuries, they don't mean that something serious is going on; they just tell us on the surface if something is actually going wrong. So that looking and paying attention to those surface injuries can make a huge difference for the future. Bruises are so

uncommon in these infants, that when you do see them we really need to, just really stop and understand what's going on and look much more carefully. And I think the most valuable thing that I've learned from doing this work that's been funded—and in our previous work as well, is that it really is about the child's environment, it is not about the bruise. It's not about the injury as much as it is what that injury tells us, that there's something really going wrong in the environment, in that child's environment, and that they are actually indicators that that environment is actually dangerous. I think of it as like the canary in the coal mine. Yes, it's like the canary matters, but what really matters is what is the environment that is actually putting that child at risk is, that's where I think we can do our most exciting prevention work, identifying what's going wrong so that we can actually help families before something really goes wrong or if it's beyond help, make sure that that child is actually safe and that they can actually grow up to have a wonderful, happy and healthy brain. Half—50 percent—of our fatal or near fatal cases had atypical bruising, but in 50 percent of those cases they also had a caregiver, one of the caregivers had very negative, derogatory feelings about the child, called them—cussed at them a lot—called them really horrific names, but interestingly 90 percent, when we looked carefully, of the families had some kind of, what we call the classic risk factors, where they had maybe a criminal activity, or maybe there was somebody in the child's life that actually had prior social service involvement, or somebody that had mental health issues. These things, when the child has the beginning injuries, I feel like there is so much potential and so much help that can be provided if we could just keep that child from going into a more devastating kind of injury, so I think looking at subtle things like how people feel about the child and looking at these early injuries, like these bruises or subtle type injuries can actually have a huge... make a huge impact, and make a big difference for the child future.

Dr. Guttmacher: Thank you, Dr. Pierce for those suggestions and prevention of what truly is a major public health problem, for those of us who care about kids. I'd like to let our listeners know that the NICHD website home page currently features a Spotlight on Child Abuse Prevention Month. The Spotlight describes the results of NICHD-supported research on this topic and links to additional sources of information. You can look for it at <http://www.nichd.nih.gov>. That brings us to the end of our podcast for this month. I'd like to thank Dr. Valerie Maholmes, Dr. Cindy Christian, and Dr. Mary Clyde Pierce for talking with us

today about this important public health issue. I'd also like to thank our podcast listeners for joining us—and for your interest in our work here at NICHD.

For more information on any of today's topics and many related topics, do visit <http://www.nichd.nih.gov>. That's <http://www.nichd.nih.gov>. I'm Alan Guttmacher, and I hope you will join us for more NICHD podcasts as we post them on our website each month.

Announcer: This has been *NICHD Research Perspectives*, a monthly podcast series hosted by Dr. Alan Guttmacher. To listen to previous installments, visit nichd.nih.gov/researchperspectives. If you have any questions or comments, please email NICHDInformationResourceCenter@mail.nih.gov.