



Abusive Head Trauma: The victims, their outcomes, and prevention strategies



Megan McGraw, MD

Child Abuse Pediatrician

Center for Child & Family Advocacy, Nationwide Children's Hospital

Assistant Professor of Clinical Pediatrics

The Ohio State University College of Medicine

Objectives



- Understand the epidemiology of Child Maltreatment
- Understand the clinical presentation and physical findings of Abusive Head Trauma
- Discuss the long term outcomes of Abusive Head Trauma
- Discuss examples of child maltreatment prevention programs, their evidence, and their limitations

Case for thought . . .



- 3 month old male left with mom's boyfriend while she went to work.
- Boyfriend called mom ~ 4 hours later saying that the baby stopped breathing. Mom told him to call 911.
- Evaluated at the hospital, diagnosed with Abusive Head Trauma but died from his head injury.
- Boyfriend later confessed to shaking the baby because he lost his temper. The baby wouldn't stop crying.
- What could we have done to prevent this 3 month old from being injured and ultimately from dying?

Epidemiology





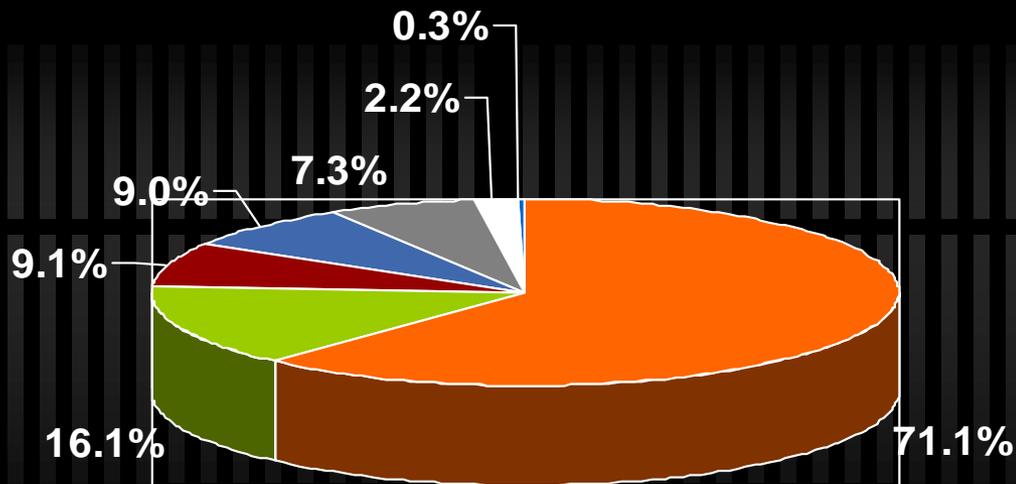
2008 U.S. Data



- 3.3 million referrals of child abuse and neglect, involving 6 million children
 - ~ 63% reached the investigation stage (~ 1.5 million cases)
 - ~ 800,000 cases determined to be abuse

- Rate of victimization = 10.3 per 1000 children
 - Ohio rate – 13.2 per 1000 children

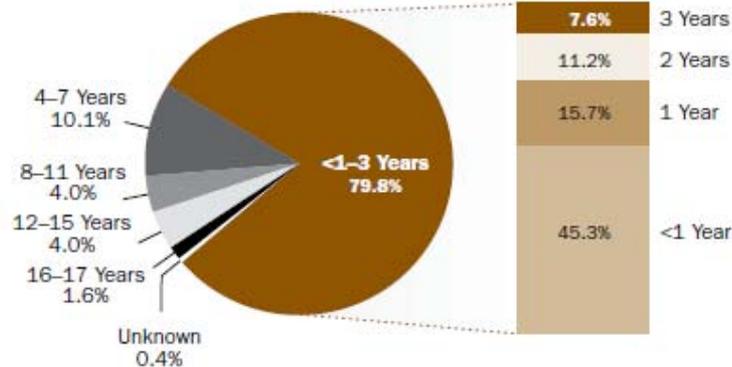
Types of Maltreatment



- Neglect**
- Physical Abuse**
- Sexual Abuse**
- Other**
- Psychological**
- Medical Neglect**
- Unknown**

2008 Child Abuse Fatalities

Figure 4-1 Age by Percentage of Fatalities, 2008



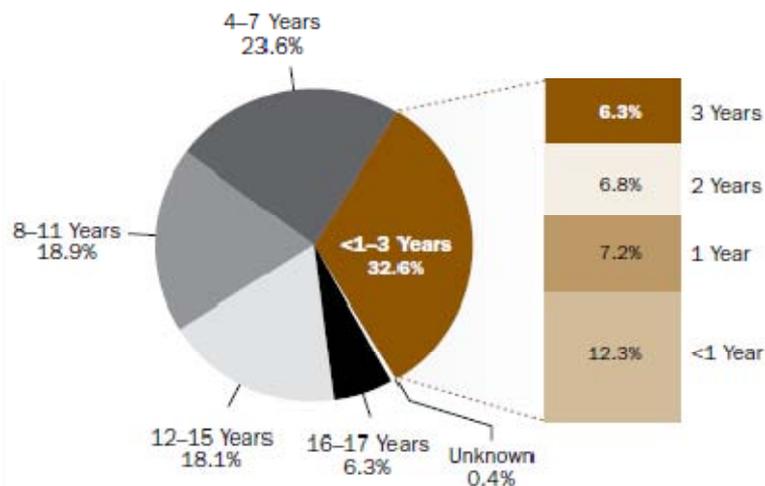
Based on data from table 4-3.

- Total US fatalities = 1630
 - ~80% are < 1-3 years
 - ~45% < 1 year
- Total Ohio fatalities = 74 (90 in 2007)
- 4-5 kids die each day in the US as a result of child abuse and neglect

Who are the victims?

- 48% boys, 52% girls
- Rate of victimization inversely related to the child's age
 - Youngest children = highest rate
- Infants & toddlers greatest risk
- AHT victims:
 - Mean age 3-4 months

Figure 3-3 Percentage of Victims by Age, 2008



Based on data from table 3-8.



Head Trauma & Child Abuse

- 33-56% of brain injuries in children < 1 year are inflicted.
- Reported incidence:
 - 25-31 per 100,000 children < 1 year per year
- Carolinas study:
 - Rate of abusive head trauma was 17.0 cases per 100,000 live births
 - But, they estimate that for every child < 2 years who sustains a serious head injury **another 152 go undetected**

Nationwide Children's Hospital Trauma Registry

Year	AHT Cases	Deaths
2001	32	4
2002	26	6
2003	26	3
2004	24	7
2005	30	5
2006	33	4
2007	26	5
2008	45	12
2009	33	8

Clinical Presentation of AHT



Shaken Baby Syndrome AKA . . .



- Abusive Head Trauma (AHT)
- Inflicted Head Injury
- Abusive Head Injury
- Non-accidental Head Injury/Trauma

- We are trying to stay away from the term SBS because it suggests mechanism and can be problematic in court.



Abusive Head Trauma

- Infants with intracranial injury
 - No plausible history to account for injuries
 - Also can have associated retinal hemorrhages, fractures, and other injuries
- Chief complaint:
 - Lethargy, irritability, poor feeding, vomiting
 - Trauma, apnea (stopped breathing), seizures, DOA (dead on arrival)



What are the medical findings in abusive head trauma?



The Shaking

- Held by arms or chest
- ***Violent*** shaking





FIGURE 1

Acceleration-deceleration injury



Violent shaking produces acceleration-deceleration forces that cause significant injury to the brain. Rotational forces exerted on the brain result in shear injury.

AMY COLLINS/ART AND SCIENCE

FIGURE 3

The magnifying force of an impact injury



The impact of the infant's head against a solid surface magnifies the forces suffered by the brain by 10 to 50 times compared to the forces caused by shaking alone.

AMY COLLINS/ART AND SCIENCE

Hemorrhage over brain (Subdural Hematoma)

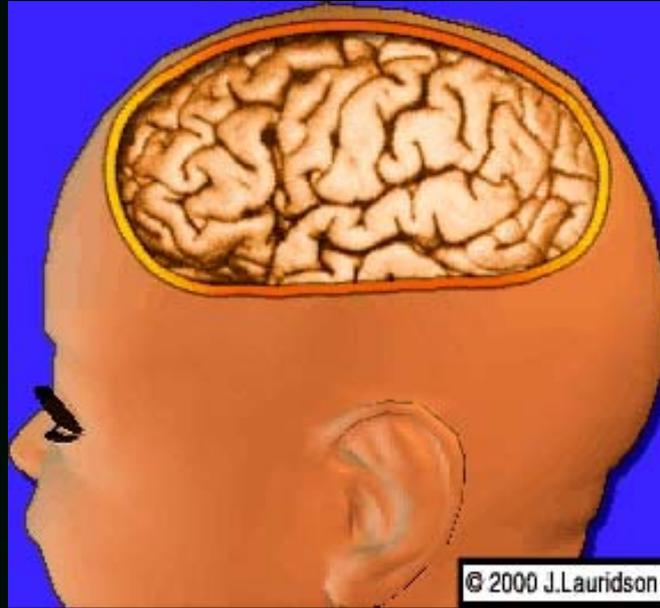
Hemorrhage in eyes (Retinal Hemorrhages)

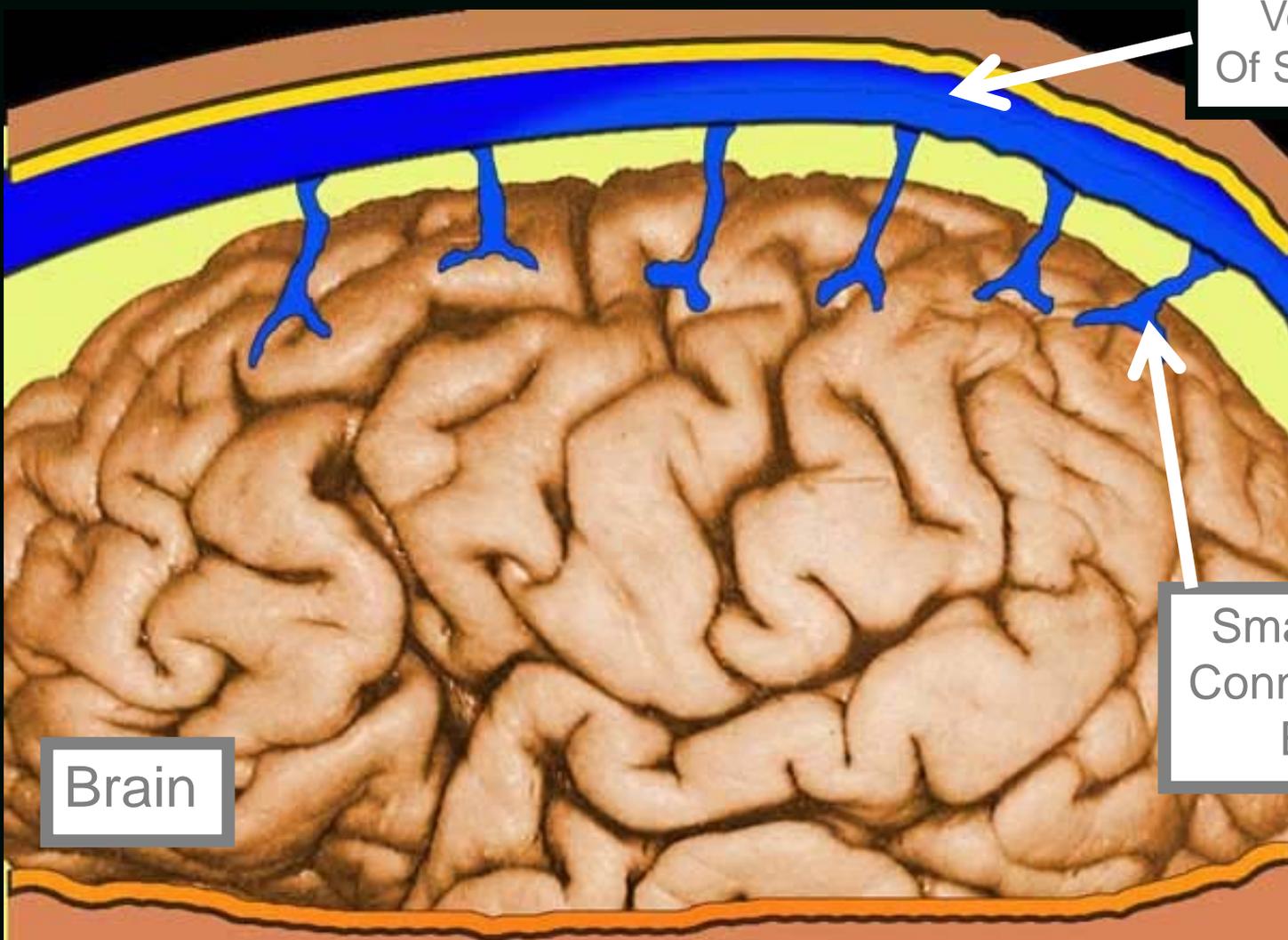
Abusive Head Trauma (SBS)



Bruising on scalp or skull fracture

AHT with Impact

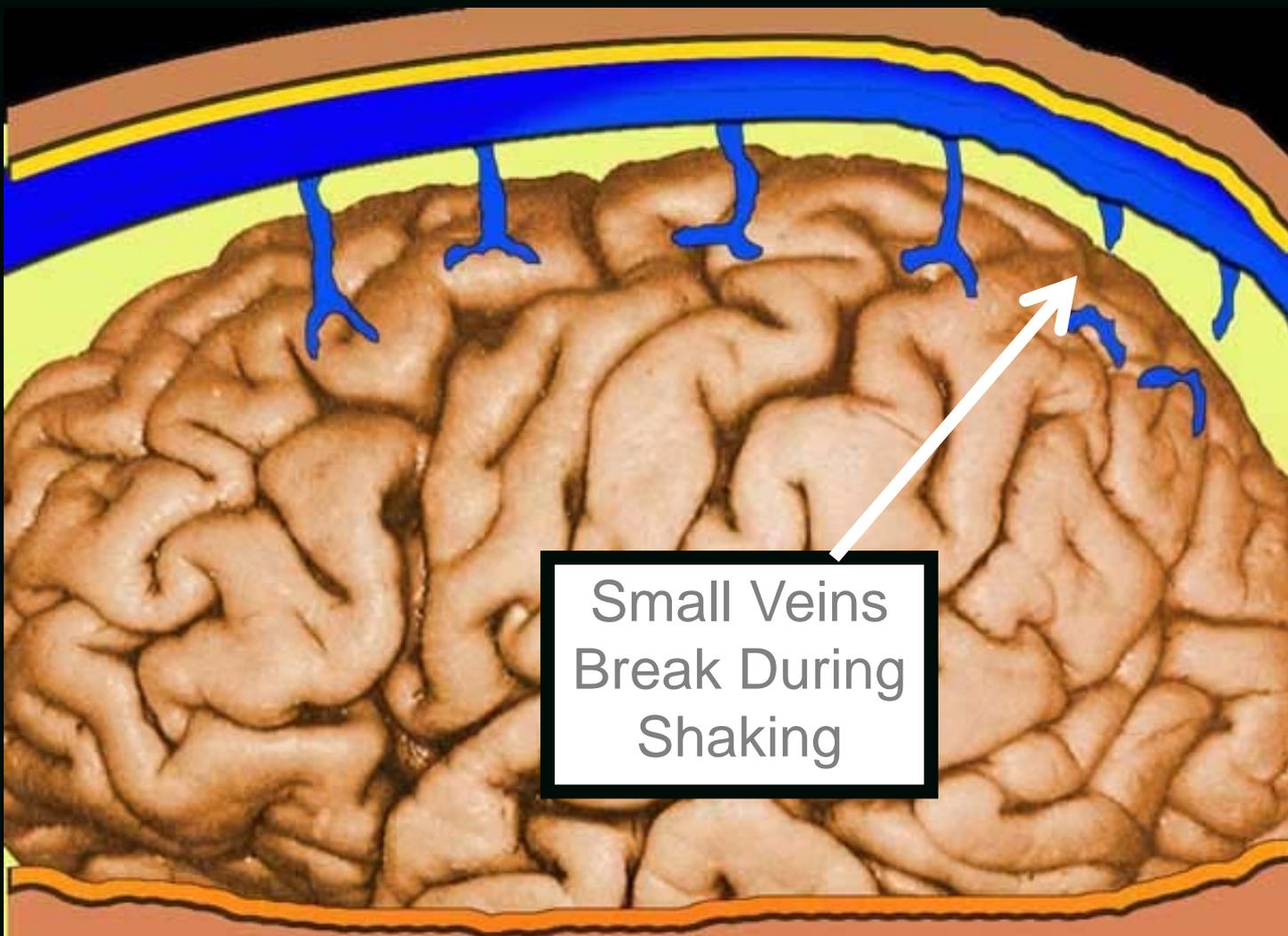




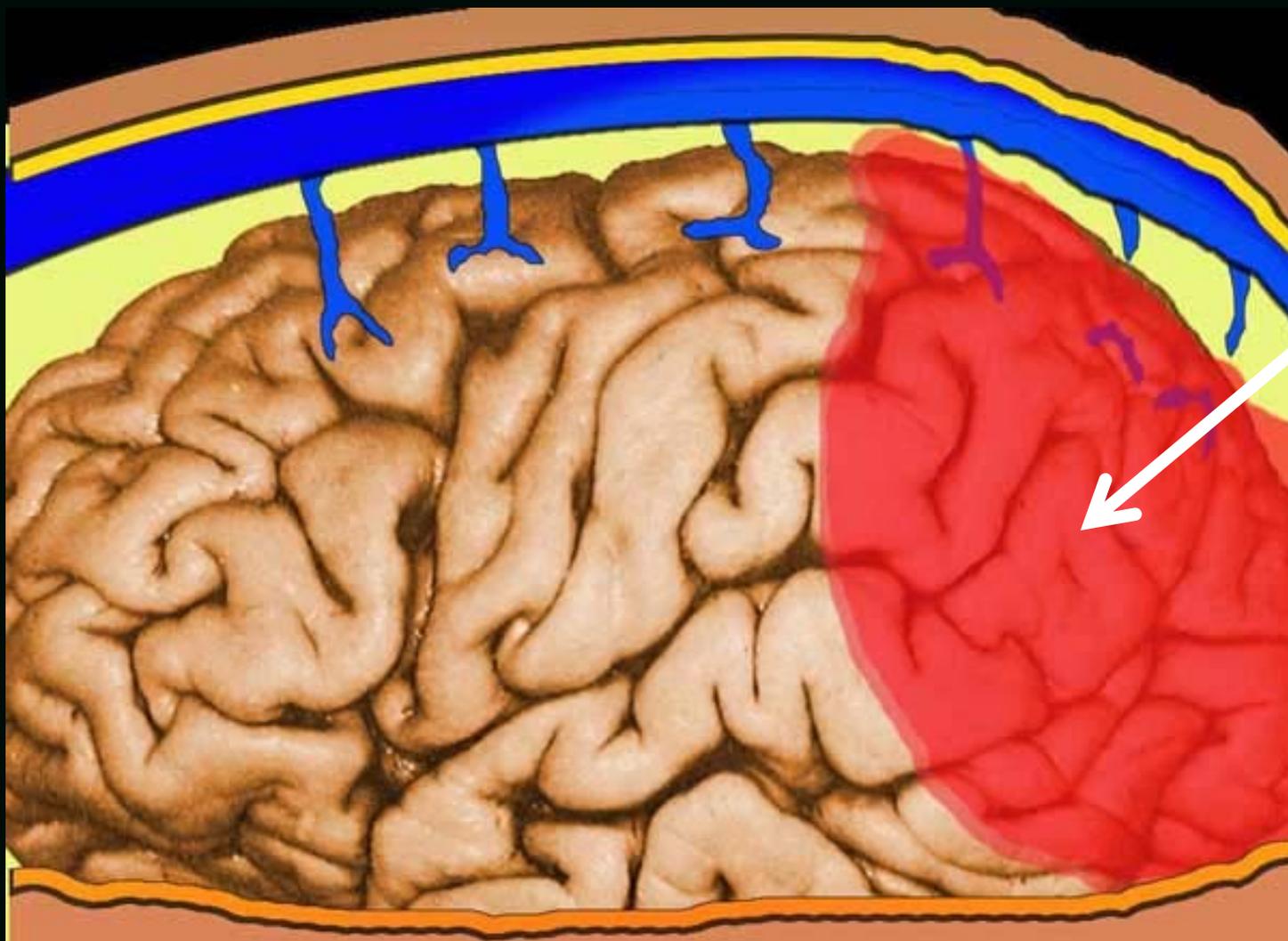
Vein Along Inside Of Skull (sagittal vein)

Small Veins Connecting to Brain

Brain

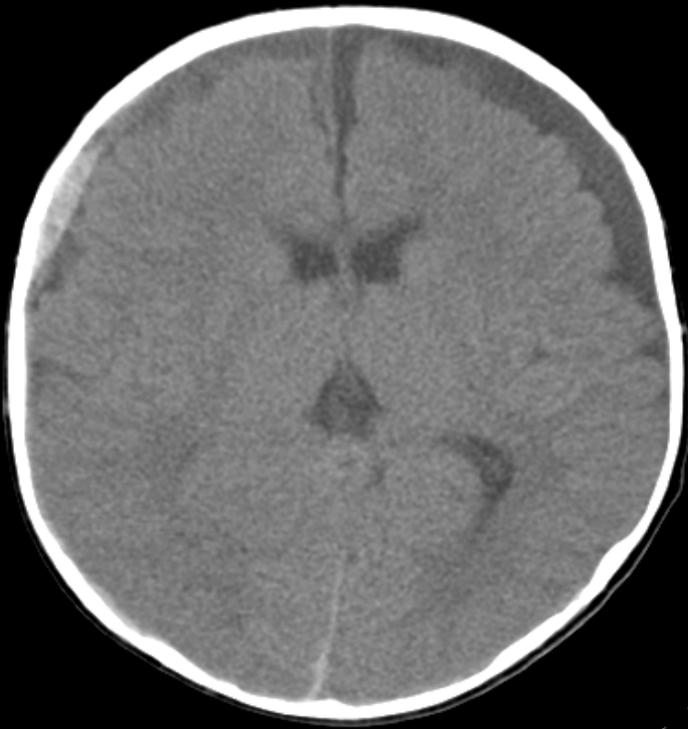


Small Veins
Break During
Shaking



Bleeding
Around
Brain
(Subdural
Hematoma)

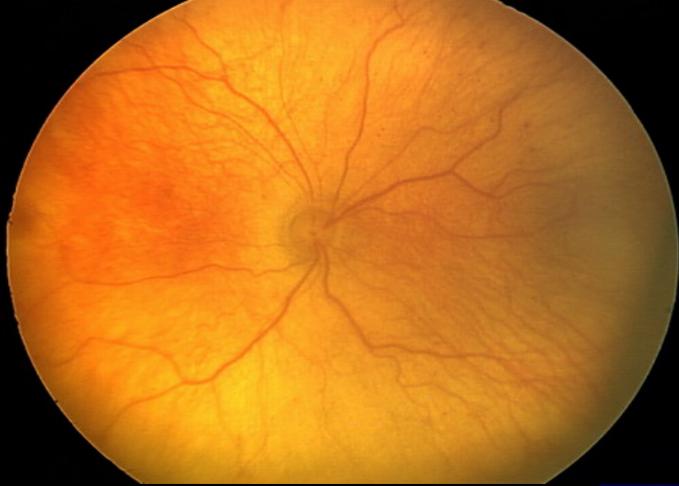
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Retinal Hemorrhages

- Incidence: 70-80%
- Ophthalmologist is the best to diagnose
 - Must describe the type, location, number, and distribution
- Cannot accurately date
- Can be seen in other conditions
 - Specificity for abuse depends on characteristics of RH



Normal Retina

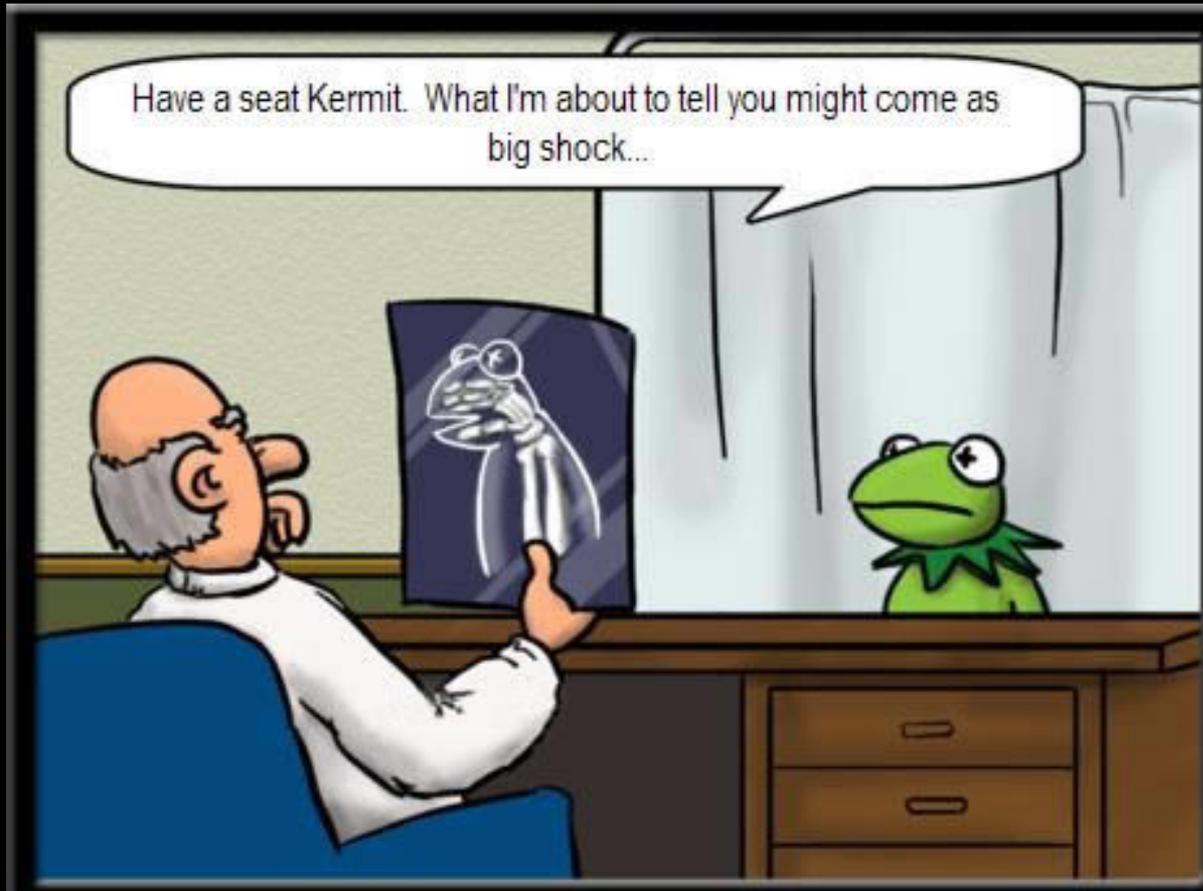


Numerous RH,
extending to the
periphery, in multiple
layers

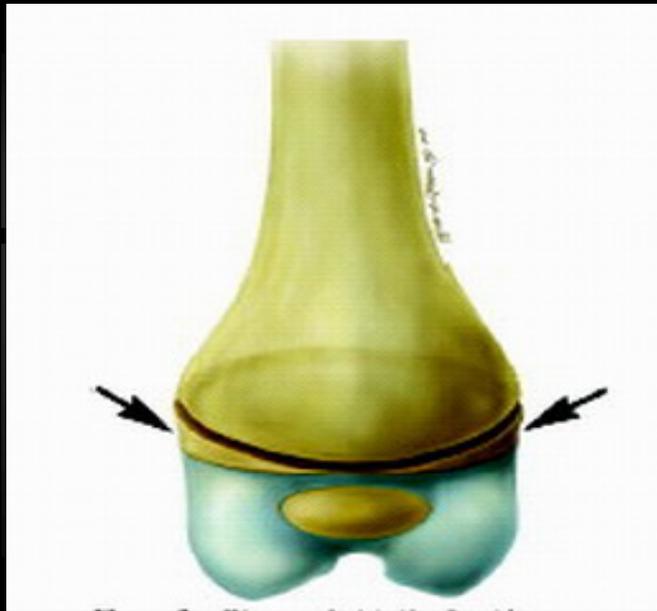


Few posterior pole RH
= Non-specific

What about fractures and AHT?

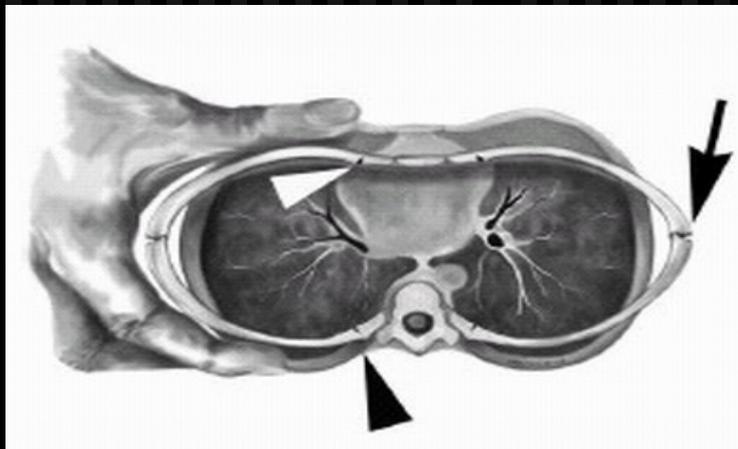


Classic Metaphyseal Lesion (CML) (Bucket Handle or Corner Fracture)



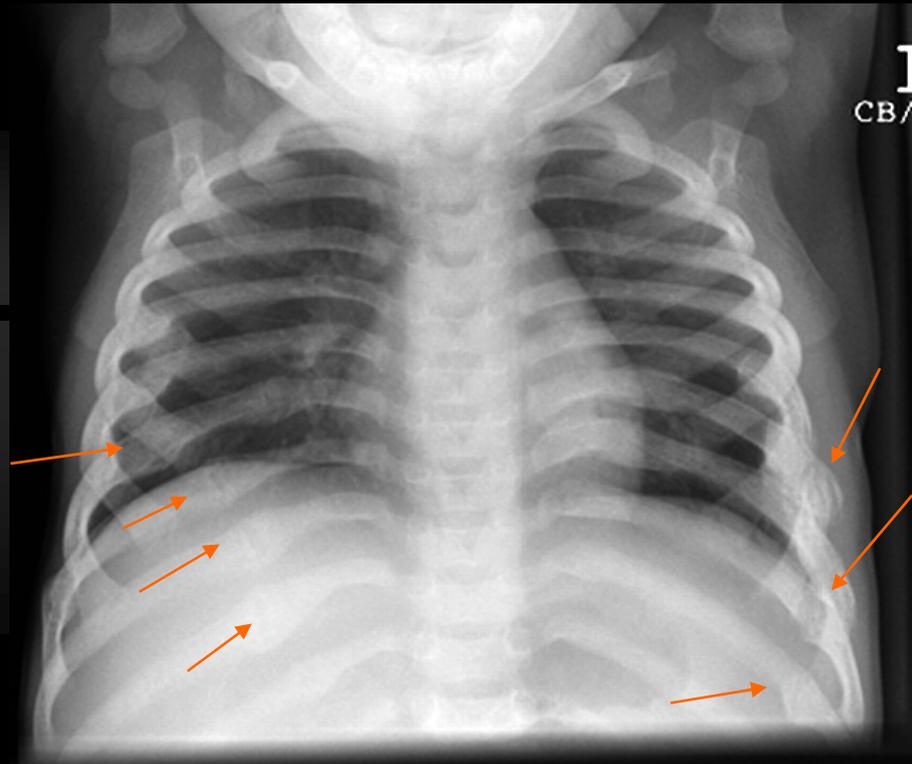
Source: Radiographics, 2003

Lateral and posterior rib fractures



lateral

posterior



Additional Injuries

- Abdominal injury
 - Liver laceration
 - Bowel injury
 - Pancreatic/spleen injury
- Skin injuries
 - Bruising
 - Burns

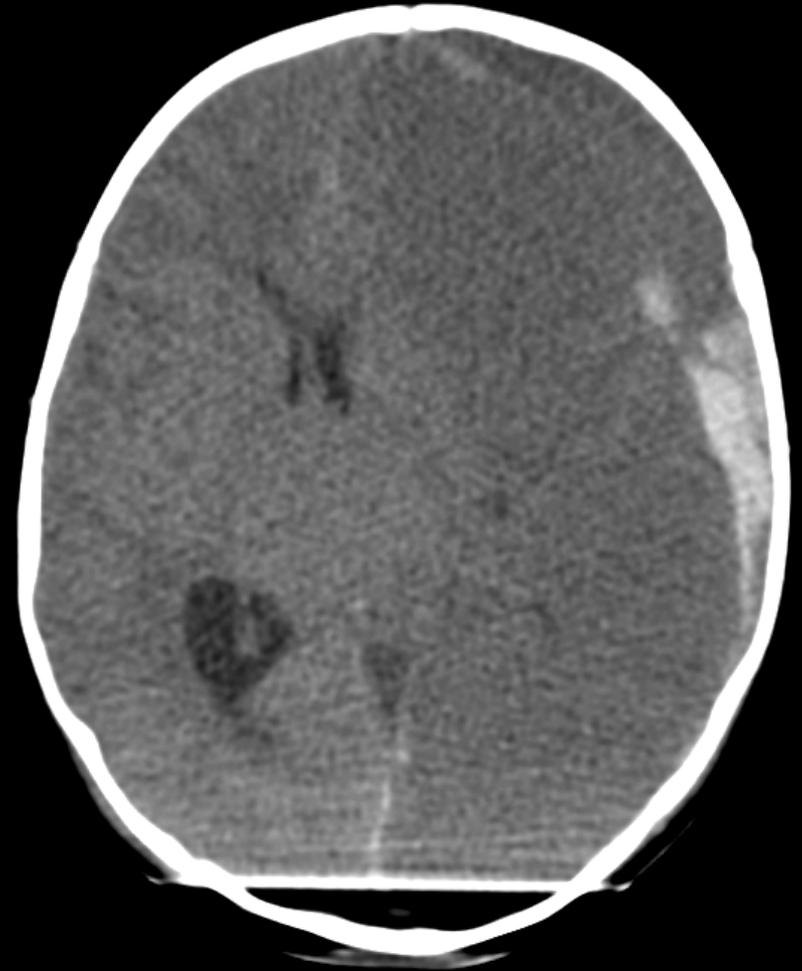


Outcomes of AHT

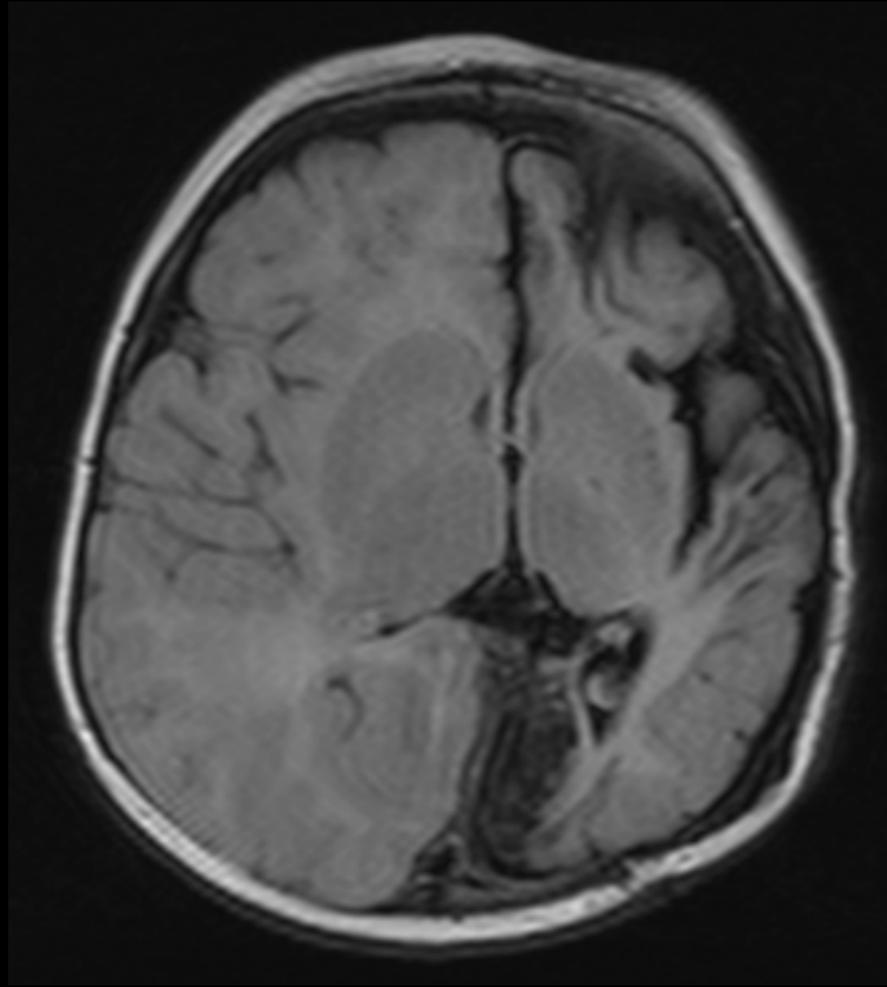


Case Example

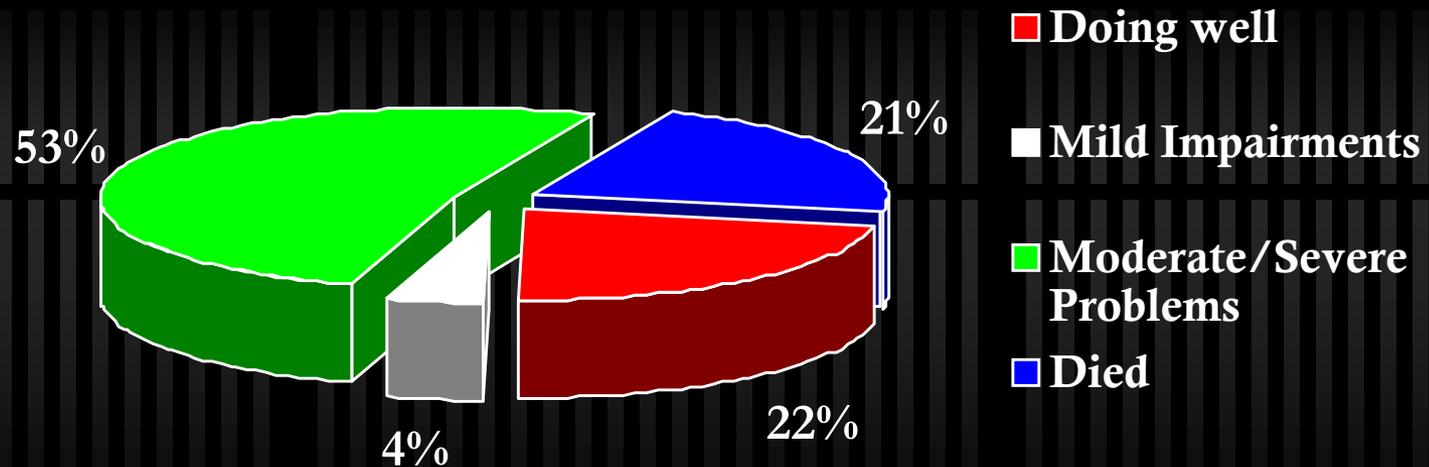
- 2 month old male
- Reportedly rolled off bed (single mattress on the floor)



Follow up MRI 6 months post injury



Abusive Head Injury Outcomes





Head injury

Bleeding, cerebral edema and brain injury

Neurologic sequelae in ~50% of survivors

Blindness

Vegetative State

Seizures

Learning Disability

Abusive Head Injury Outcomes



Impairments include:

- Paralysis
- Cerebral palsy
- Seizures
- Feeding difficulties (g tube)
- Breathing problems (trach)
- Blindness or visual impairment
- Deafness
- Developmental delay
- Behavioral problems

Prevention Strategies

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search ID: mben718

"Of course I know what he wants when he cries. He wants you."

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search ID: dpanz212

"Either switch off his batteries or take 'em out!"

Back to a case . . .

- 3 month old male left with mom's boyfriend while she went to work.
 - Boyfriend called mom ~ 4 hours later saying that the baby stopped breathing. Mom told him to call 911.
 - Evaluated at the hospital, diagnosed with Abusive Head Trauma, but died from his head injury.
 - Boyfriend later confessed to shaking the baby because he lost his temper. The baby wouldn't stop crying.
-
- What could we have done to prevent this 3 month old from being injured and ultimately from dying?

When considering prevention programs remember some points . .

- Abuse is seen in ALL cultural and socioeconomic groups
- If no intervention
 - 50% chance of repeated abuse
 - 10% chance of mortality
- Ages of victims (infants)
- Cause of injuries (shaking +/- impact)
- Triggers?
- Risk factors?
- Perpetrators?

Triggers . . .

- Shaking may result from tension or frustration of the caregiver (i.e. crying)
- Unrealistic expectations of the infant
- May not be an isolated event
 - 70% of AHT cases have evidence of prior abuse



Risk Factors . . .



- Family stressors may place the child at risk
 - Financial
 - Domestic Violence
 - Substance Abuse
 - Mental Health
- Small children vulnerable
- Children with disabilities vulnerable

Economy and Child Abuse



- Berger et al, 2010 (abstract presentation)
 - Descriptive study (1/1/04 – 6/30/09)
 - 4 major children's hospitals
 - Pittsburgh
 - Columbus
 - Cincinnati
 - Seattle
 - 512 patients
 - Significant overall increase in number of cases of AHT in the months after the start of the recession

Perpetrators



- Starling et al, 1995
 - Fathers/step-fathers: 37%
 - Boyfriends: 21%
 - Mothers: 13%
- Parents/partners make up ~ 75% of perpetrators.
- Scribano et al, 2010 (abstract presentation)
 - Father: 52%
 - Boyfriend: 21%
 - Mother: 8%
 - Babysitter: 8%
 - Other adult caregiver: 11%
- Non-biologic perpetrator = 40%

Evidence Based AHT Prevention Programs

- Period of Purple Crying (Barr)
- NY State Parent Education (Dias)

Period of Purple Crying Model

- Barr et al 2009
 - Randomized, controlled trial
 - Prenatal classes, maternity wards, and pediatric practices
 - ~1400 mothers randomized to intervention group
- Intervention Group:
 - Materials
 - 11 page booklet
 - 12 minute DVD
- P: peak pattern of crying
- U: unexpected onset
- R: resistance to soothing
- P: pain-like facial grimace
- L: long crying bouts
- E: evening clustering



Period of Purple Crying Model



- Materials designed and produced by the National Center on Shaken Infant Syndrome
 - Describe SBS
 - Emphasize telling other caregivers about “PURPLE” crying
- 3 action steps:
 - Increase “carry, comfort, walk and talk” response
 - OK to walk away, put the infant down safely, and calm yourself
 - Never shake or hurt an infant

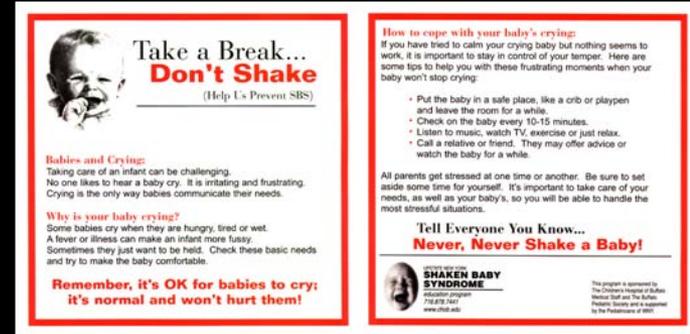
Period of Purple Crying Model



- Results
 - Improved knowledge about infant crying and dangers of shaking
- Limitations:
 - Not designed to test whether PURPLE materials prevent SBS

NY Experience

- Dias et al 2005
 - Comprehensive parent education program about violent infant shaking
 - All hospitals providing maternity care in an 8 county region in western New York state
 - Program administered to all parents before the infant's hospital discharge



Take a Break... Don't Shake
(Help Us Prevent SBS)

Babies and Crying:
Taking care of an infant can be challenging. No one likes to hear a baby cry. It is irritating and frustrating. Crying is the only way babies communicate their needs.

Why is your baby crying?
Some babies cry when they are hungry, tired or wet. A fever or illness can make an infant more fussy. Sometimes they just want to be held. Check these basic needs and try to make the baby comfortable.

Remember, it's OK for babies to cry: it's normal and won't hurt them!

How to cope with your baby's crying:
If you have tried to calm your crying baby but nothing seems to work, it is important to stay in control of your temper. Here are some tips to help you with these frustrating moments when your baby won't stop crying:

- Put the baby in a safe place, like a crib or playpen and leave the room for a while.
- Check on the baby every 10-15 minutes.
- Listen to music, watch TV, exercise or just relax.
- Call a relative or friend. They may offer advice or watch the baby for a while.

All parents get stressed at one time or another. Be sure to set aside some time for yourself. It's important to take care of your needs, as well as your baby's, so you will be able to handle the most stressful situations.

Tell Everyone You Know... Never, Never Shake a Baby!

SHAKEN BABY SYNDROME
Prevention Program
716.875.5667
www.wchob.org

This program is sponsored by The Children's Hospital of Buffalo Medical Staff and The Buffalo Medical Society and is approved by the Healthcare of 2005.

NY Experience



- Simple message received by all parents:
 - 1 page leaflet (*Prevent Shaken Baby Syndrome*, American Academy of Pediatrics)
 - 11 minute video
 - Asked to voluntarily sign commitment statement (CS)
- Regional incidence of abusive head injuries in children < 36 months tracked prospectively for 66 months

NY Experience



- Results:

- ~65,000 commitment statements (69% of live births in the region)
- Incidence of AHT decreased by 47%
 - 41.5 per 100,000 live births during 6 year control period (prior to study)
 - 22.2 cases per 100,000 live births during 66 month study period

- Limitations:

- One region, can it be replicated in other settings?
- Not randomized, controlled trial therefore confounding variables

Claire's Law in Ohio



- Claire Fishpaw
 - In 2000, Claire, age 11 months, was shaken by her babysitter
 - Still followed by many doctors and therapists
 - OT, PT, speech therapy, endocrinologist, optometrist, neurologist, neuropsychologist, pediatrician, & rehabilitation doctor
- Legislation which establishes a shaken baby syndrome/AHT education program within the Ohio Department of Health.
 - Requires all hospitals which deliver babies to distribute educational materials to parents.
 - Tracking of cases
 - Through children services
 - Uses the terminology of “shaken baby syndrome”

**You are your baby's protector.
Choose caregivers wisely.**

Even when you aren't with your baby, you are responsible for your baby's safety.

Before leaving your baby with anyone, ask these questions:

- Does this person want to watch my baby?
- Have I had a chance to watch this person with my baby before I leave?
- Is this person good with babies?
- Has this person been a good caregiver to other babies?
- Will my baby be in a safe place with this person?
- Have I told this person to never shake my baby?

Trust your instinct. If it doesn't feel right, don't leave your baby!

Do not leave your baby with anyone who:

- Is impatient or annoyed when your baby cries.
- Says your baby cries too much.
- Will become angry if your baby cries or bothers them.
- Might treat your baby roughly because they are angry with you.
- Has a history of violence.
- Has lost custody of their own children because they could not care for them.
- Abuses drugs or alcohol.

**Tell anyone who cares for your baby to call you any time they become frustrated.
Tell them not to shake your baby.**

**Has Your Baby Been Shaken?
Call 911.**

All of these signs are very serious:

- Limp, like a rag doll.
- Poor sucking and swallowing.
- Trouble breathing.
- Unable to waken.
- Irritability or crankiness.
- Seizures or trembling.
- Vomiting.
- Skin looks blue or feels cold.

Save precious time! If you think your baby has been shaken, tell the doctors right away!

For more help coping with a crying baby:


Help me grow
1-800-755-GROW



Ohio Department of Health
246 North High Street
Columbus, Ohio 43215
<http://www.odh.ohio.gov>

**Babies cry
a lot.**



It's normal.

Learn more and have a plan.

Keep your baby safe!

Evidence Based Child Maltreatment Programs

- Home Visitation
 - Most common child abuse prevention strategy
 - Addresses maternal and child well being
 - Intervention provides social support, community referrals, parent knowledge of child development, and empowerment

Home Visitation Programs



- **Healthy Families America**
 - www.healthyfamiliesamerica.org
 - Uses social workers/paraprofessionals
 - Limited benefit in reducing family violence
- **Nurse Family Partnership**
 - www.nursefamilypartnership.org
 - Uses RN beginning during pregnancy
 - Significant evidence to demonstrate decrease in child maltreatment

Nurse Family Partnership (NFP)

- Started in Elmira, NY in 1977
 - Now operating in ~ 350 counties in the U.S. often with state and local government support (HMG)
- Subjects:
 - 1st pregnancy
 - Had at least one of the following:
 - < 19 years low-income women
 - Unmarried
 - Low socioeconomic status (Medicaid status or no private insurance)
- Several randomized, controlled trials at different sites demonstrated effectiveness with more than 30 years of experience

Nurse Family Partnership (NFP)



- Visit schedule (lasted 1 hr 15 minutes) by RNs
 - During pregnancy: every 2 weeks
 - 0 to 6 weeks: every week
 - 6 weeks to 4 months: every 2 weeks
 - 4 to 14 months: every 3 weeks
 - 14 to 20 months: every 4 weeks
 - 20-24 months: every 6 weeks

Nurse Family Partnership (NFP)



- Nurses promoted 3 aspects of maternal functioning:
 - Health-related behaviors during pregnancy and early years of child's life
 - Care parents provided to their children
 - Maternal personal life-course development
 - Family planning
 - Educational achievement
 - Participation in workforce
- Encouraged involvement of family and friends
- Linkage of family members with other health and human services
 - Vocational Services, Planned Parenthood, Mental Health Services, Legal Services, WIC

NFP: Improved Prenatal Health



- 79% reduction in preterm delivery for women who smoke
- 25% reduction in cigarette smoking during pregnancy
- Greater intervals between 1st and subsequent pregnancies

NFP: Improved Economic Self-Sufficiency



- 32% fewer unintended subsequent pregnancies
- 83% increase in labor force participation by the mother by child's 4th birthday
- 20% reduction in months on welfare
- 46% increase in father's involvement in the household

NFP: Reduction in Criminal Activity



- 59% reduction in child arrests at age 15
- 69% fewer arrests among mothers
- 44% reduction in alcohol or drug use

NFP: Reduction in Injuries

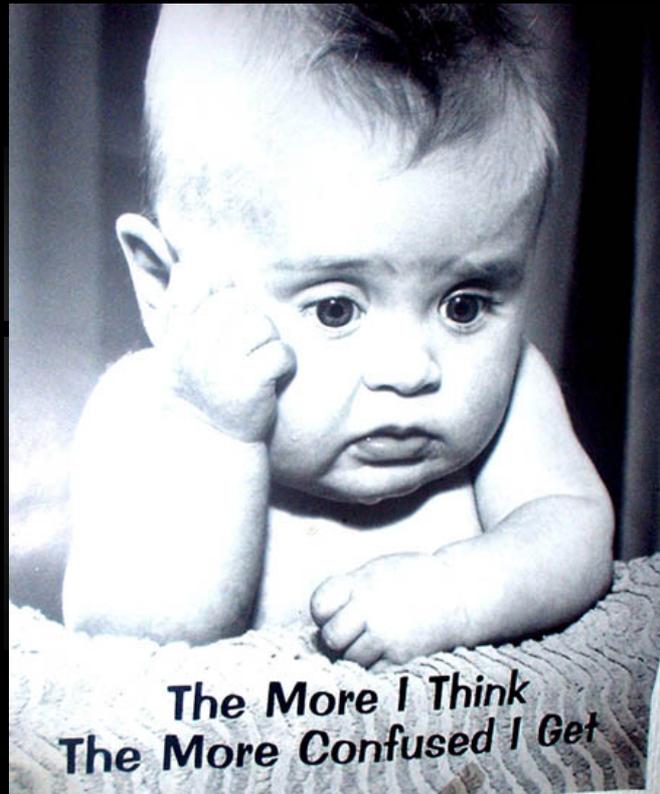


- 39% fewer injuries among children
- 56% reduction in ER visits for accidents and poisonings
- 79% reduction in child abuse rates from birth to 15 years

Olds DL, et al. *JAMA* 1997; 278(8): 637-643.

<http://www.nursefamilypartnership.org/proven-results/prevent-child-abuse>

Questions?



megan.mcgraw@nationwidechildrens.org