AAP ZIKA ECHO
(EXTENSION FOR COMMUNITY HEALTHCARE OUTCOMES)
HOUSEKEEPING ITEMS

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• Project ECHO® collects participation data for each ECHO session. This data allows Project ECHO to measure, analyze, and report on the ECHO movement’s reach. Data is used in reports, on maps and visualizations, for research, for communications and surveys, for data quality assurance activities, and for decision-making related to new initiatives.
• To protect patient privacy, please do not provide any (PHI) protected health information.
• Please mute your microphone when not speaking. If you have video capability, please enable it.
• There is a chat function in Zoom that may be used to send messages to the group. For IT help, please chat to the AAP Admin and we will assist you.
Imaging the Brain of Infants and Children: Congenital Zika Syndrome

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After this presentation, you should be able to:

• Describe the modalities available to image the brain and appreciate the history of brain imaging
• Describe the relative advantages and disadvantages of the available brain imaging modalities
• Recognize the imaging features of congenital Zika syndrome
BRAIN IMAGING: A HISTORICAL PERSPECTIVE

- **Pneumoencephalography**
  - Introduced in 1919 and used until the 1970s when it was replaced by computed tomography.

- **Cerebral angiography**
  - Introduced in 1927 and still used.

- **Cranial (head) ultrasound**
  - Introduced in the 1940s and still used. The invention of ultrasound was stimulated by the sinking of the Titanic on April 15, 1912.
HISTORICAL PERSPECTIVE

• Computed tomography (CT)
  – Conceived of by Oldendorf in the 1960s and perfected by Hounsfield at EMI in 1971 and still used.

• Magnetic resonance imaging (MRI)
  – Invented in the 1970s and introduced in the mid-1980s. Widely used.
## Imaging the Child’s Brain

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<th>Characteristic</th>
<th>Modality</th>
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<td></td>
<td>Ultrasound</td>
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<tr>
<td><strong>Risks</strong></td>
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<td><strong>Advantages</strong></td>
<td>• Portable, rapid</td>
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<td><strong>Disadvantages</strong></td>
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CONGENITAL CMV INFECTION

Ultrasound  CT  MRI
Zika Virus: History

- 2014-15: Massive Brazilian Zika virus outbreak with an epidemic of congenital microcephaly.

Source: Google Images: Zika Microcephaly
Zika Virus: Brain Abnormalities

- Microcephaly
- Intracranial calcifications: subcortical (characteristically) or periventricular
- Cortical dysplasia: Polymicrogyria, pachygyria, lissencephaly
- Hydrocephalus: passive or obstructive
- Abnormalities of the corpus callosum
- Stroke?
- Fetal brain disruption
CONGENITAL ZIKA SYNDROME

Source: Google Images: Zika Microcephaly
CONGENITAL ZIKA SYNDROME

Calcifications

Cortical Dysplasia

Source: Soares de Oliveira-Szejnfeld, P. Radiology 2016

**CONGENITAL ZIKA SYNDROME**

Fetal Brain disruption

- Rare before Zika
- Severe brain destruction
- Intracranial calcifications
- Collapse of skull and scalp
- Profound microcephaly

PATHOGENESIS OF BRAIN ABNORMALITIES IN CONGENITAL ZIKA VIRUS INFECTION

Maternal viremia → Placental infection → Fetal viremia

→ Fetal hypoxia/ischemia

→ Neuronal cell loss
→ Abnormal neuronal migration

→ CNS invasion

Fetal Viremia
AN APPROACH TO IMAGING INFANTS WITH CONGENITAL ZIKA SYNDROME

- Head ultrasound in the immediate neonatal period. Consider CT if the anterior fontanel (acoustic window) is closed or very small.
- Definitive imaging (MRI) when able, depending on MRI availability, the infant’s age and the condition of the infant. Note that MRI can miss intracranial calcifications, an important feature of Congenital Zika Syndrome.
- When serial imaging is needed, choose the modality that provides the most information with the least risk to the infant.
QUESTIONS?