

CONGENITAL CMV: SCREENING, DIAGNOSIS, AND IMPLICATIONS FOR AUDIOLOGY

Maggie Kettler
Senior Clinical Director
Cincinnati Children's Hospital Medical Center



INTRODUCTION TO CMV

CMV is dangerous
for people who are
immunocompromised

- Organ transplants
- HIV/AIDS
- Chemotherapy
- Babies before birth

What is CMV

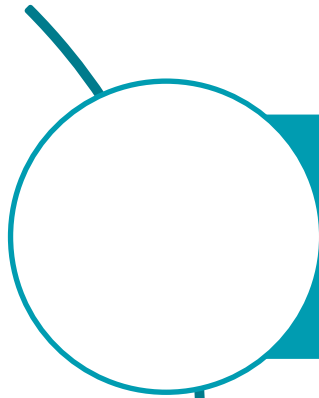
- Herpes virus
- Common Virus-Typically Harmless when contracted
- Appears like a cold-sore throat, fever, fatigue, swollen glands
- Symptoms last a few days to weeks
- 50-80% of adults have contracted CMV by the age of 40 years old.
(CDC data)

What is cCMV?



Congenital CMV is CMV that is contracted during pregnancy or birth

- 1 in 200 babies are born with congenital CMV
- It is the most common congenital viral infection in the US
- 1 in 5 children with cCMV will develop permanent health problems
- 400 babies die annually from cCMV
- 90% of babies born with cCMV appear healthy at birth.
- Many problems associated with cCMV appear 2-3 years after birth



Congenital CMV infection is considered the most common preventable cause of neonatal disability in the United States



More children will have disabilities due to congenital CMV than other well-known infections and syndromes, including Down Syndrome, Fetal Alcohol Syndrome, Spina Bifida, and Pediatric HIV/AIDS

- Ten percent (10%) of babies born with congenital CMV will be symptomatic at birth
 - Small size for gestational age
 - Jaundice
 - Petechiae
 - Enlarged liver or spleen
 - Small head size (microcephaly)
 - Problems with their blood cell counts and low platelets.
- Approximately 75% of **symptomatic** babies will have signs of brain involvement and issues with hearing, vision, nutrition, growth, cognition, learning, and motor/muscle tone.

Prenatal Signs of CMV

- Placental thickening
- Organomegaly – abnormal enlargement of organs
- Hepatomegaly – abnormal enlargement of the liver
- Splenomegaly – abnormal enlargement of the spleen
- Pyelectasis – dilation of the renal pelvis, the funnel-like dilated proximal part of the ureter (muscular tubes that propel urine from the kidneys to the urinary bladder) in the kidney (also a marker for Down Syndrome)
- Megaloureter – abnormal dilation of the ureter
- Ascites - gastroenterological term for an accumulation of fluid in the peritoneal cavity (is a potential space between the parietal peritoneum and visceral peritoneum; that is, the two membranes that separate the organs in the abdominal cavity from the abdominal wall)
- Fetal hydrops - accumulation of fluid in the fetal compartments
- Abnormality of amniotic fluid
- Microcephaly – small head circumference, more than two standard deviations smaller than average
- Cerebral ventriculomegaly – dilation of the lateral ventricles of the brain
- Intracranial calcifications – the build-up of calcium salts in the soft tissue of the brain
- Hyperdense image in thalamic arteries
- Periventricular echodensities
- Hepatic echodensities
- Intestinal echodensities
- Cystic structures in the germinal zone

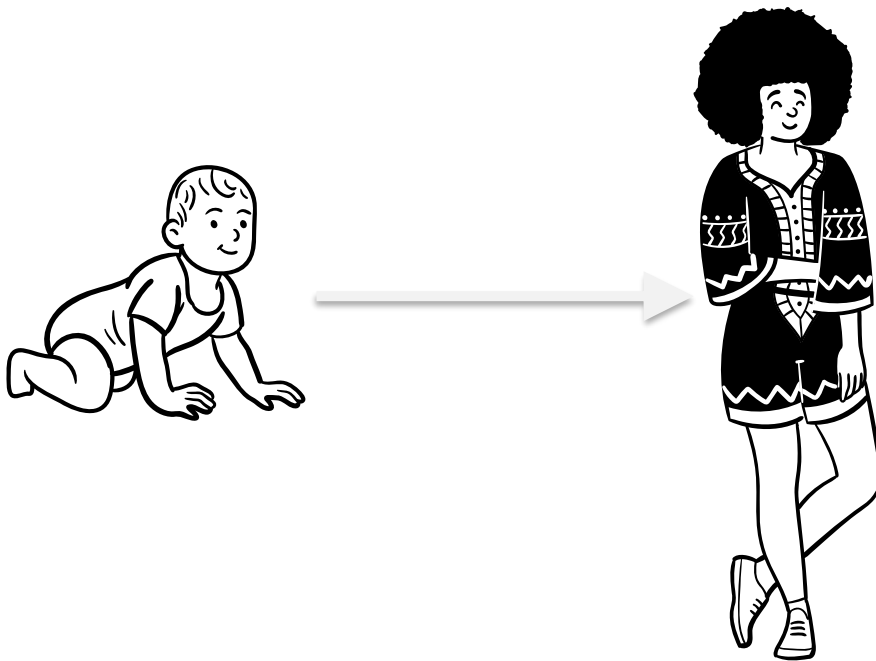
Neonatal Signs of CMV

- Thrombocytopenia – low blood platelet levels
- Petechiae (purpura) – red or purple spots on the body caused by broken blood vessels
- Jaundice – yellow skin and eyes caused by increased bilirubin levels in the blood
- Microcephaly – small head size
- Small size at birth
 - Small for gestational age (SGA)
 - Intrauterine growth restriction (IUGR)
- Premature birth of unknown etiology
- Liver problems, including Jaundice of unknown etiology
- Spleen problems
- Lung problems
- Bleeding problems
- Growth problems
- Seizures
- Hearing loss
- Vision loss
- Mental disability



TRANSMISSION

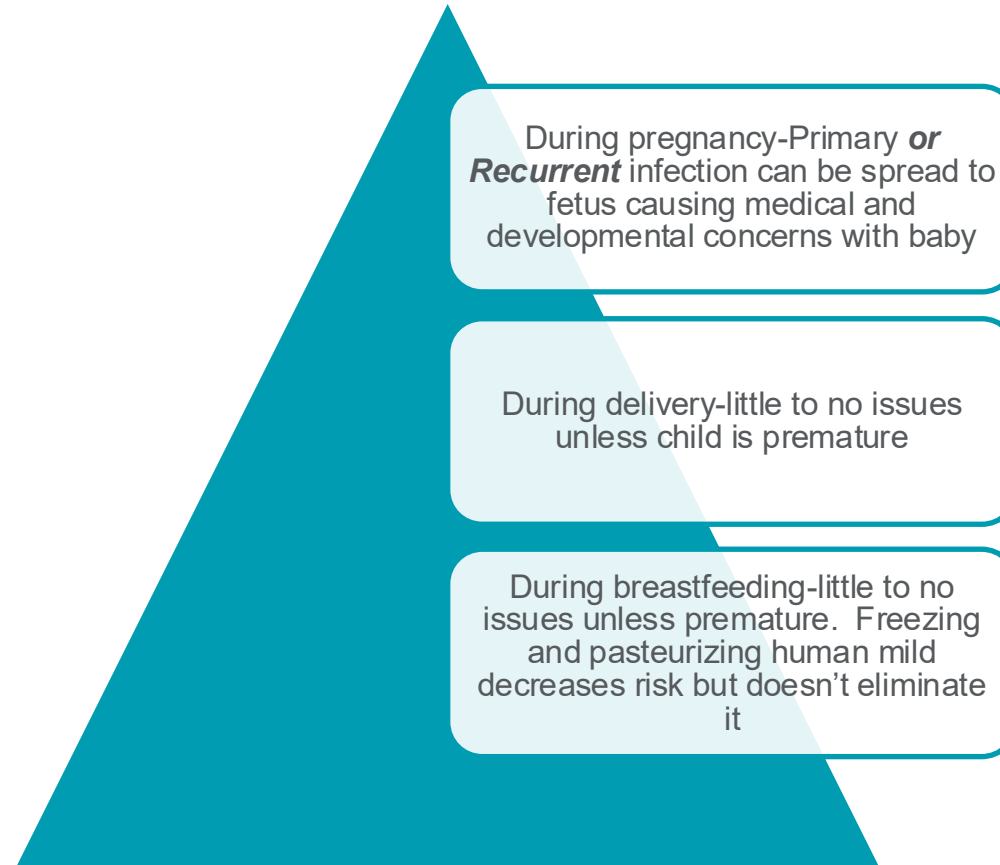
HORIZONTAL TRANSMISSION



VERTICAL TRANSMISSION



Transmission for cCMV



Risk of Transmission

- CMV can be passed to fetus anytime during pregnancy
 - Rate of transmission is lower during first trimester but impact on fetal development is most significant
 - Rate of transmission is lowest in second trimester. Second trimester infection is associated with a slight risk of developing mild childhood unilateral hearing loss, which may develop late in childhood
 - Rate of transmission is highest in third trimester but impact on fetus is lowest

Primary CMV Infection

- First time you have it
- Impacts 1-4% of pregnancies
- More likely to impact fetus than secondary infections

Recurrent CMV Infection

A previous CMV infection that becomes active again

Usually causes no issues in healthy, non pregnant person

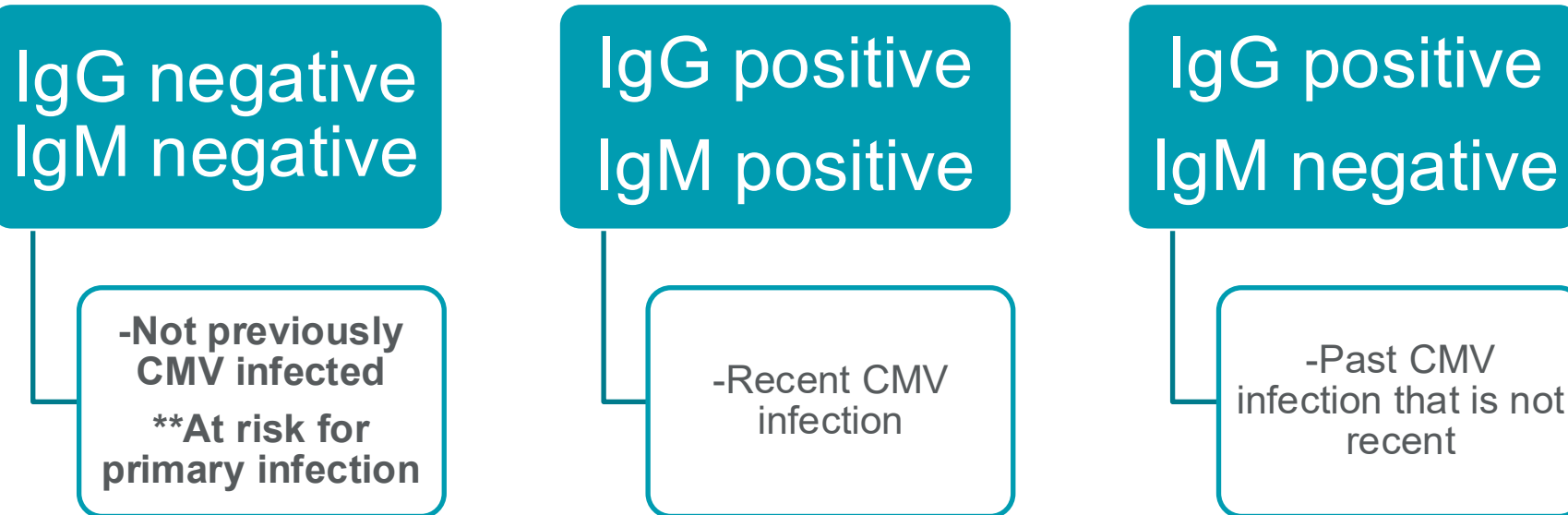
Occurs more often when immune system is down-stress, illness, medications, pregnancy

Fetus may contract and be symptomatic but usually not with severe disease

CMV Reinfection

- A person who has already contracted CMV is infected with another strain of CMV
- Very little research-challenging to know impact on mom or fetus but babies can be impacted

Primary vs Secondary Infection



SCREENING/DIAGNOSIS

CMV Screening Approaches

- Universal Screening: All newborns tested for CMV
- Targeted Screening: Only infants who fail newborn hearing screening are tested
- Expanded Targeted Screening: Infants who fail hearing screening or other common risk symptoms of CMV
- Goal: Early identification for timely intervention

Screening Methods

- Saliva PCR: High sensitivity, non-invasive (higher false positive)
- Urine PCR: Confirmatory testing
- Blood: Less sensitive, commonly used in retrospective diagnosis.



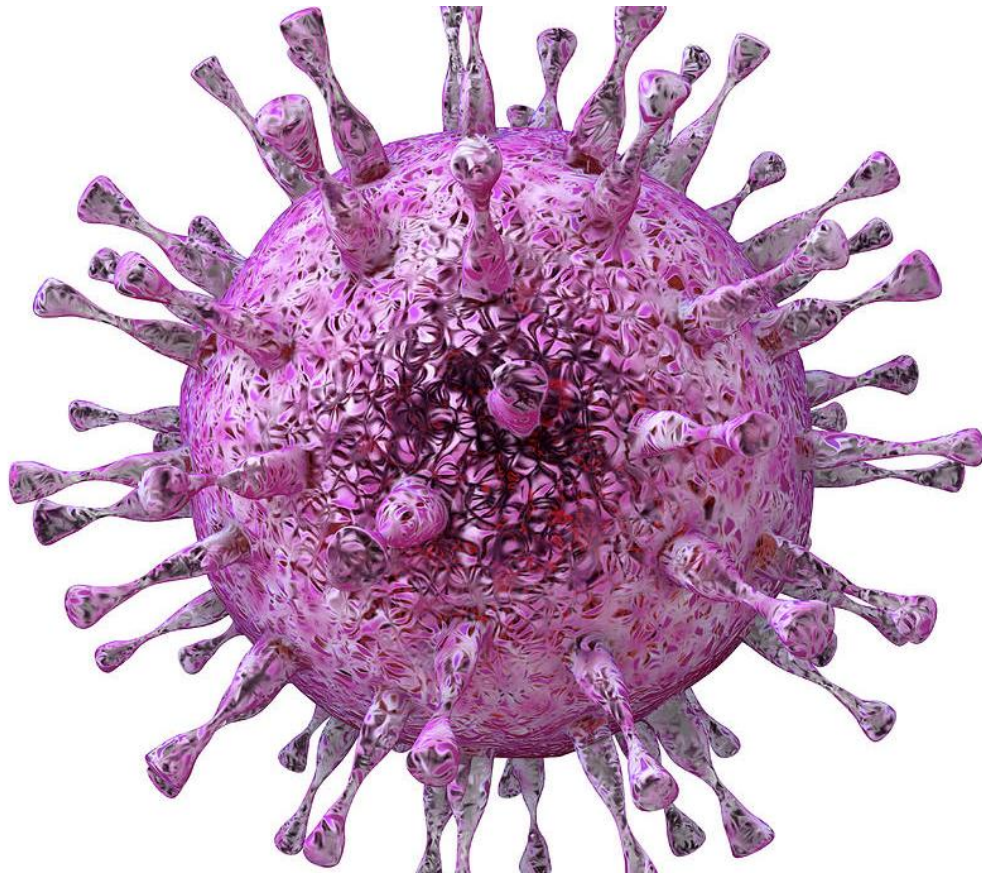
Diagnosis of Congenital CMV

- Timing: Must be confirmed within first 21 days of life
- Laboratory Confirmation: PCR testing of saliva or urine
- Imaging: Cranial ultrasound, MRI for CNS involvement
- Vision and Hearing and Additional labs should all be included

- After 21 days of age, it is recommended to obtain Dry Blood Spot testing
- Ohio and Kentucky Department of Health keep DBS cards for 2 years.
- Current bloodspot testing is about 75-80% effective



Why should audiologists care?



- Most common non-heredity cause of congenital SNHL
- 20% all pediatric SNHL

- Approximately 10-15% of otherwise asymptomatic babies have hearing loss. Hearing loss may be unilateral or bilateral and mild to severe
- Hearing loss can progress over months to several years, throughout childhood, adolescence, and even young adulthood

About 50% of children with SNHL due to cCMV infection will have progression of hearing loss

TREATMENT FOR CMV

Interdisciplinary Evaluation

- Involves audiologists, pediatricians, infectious disease specialists, neurologists and ophthalmologist
- Comprehensive assessment of hearing, vision, and neurodevelopment.

Early Intervention

- Referral to Early Intervention (EI) services
- Speech-language therapy, audiologic management
- Family education and support

Medical Follow-Up

- Regular hearing evaluations
- Developmental assessments
- Ongoing coordination with pediatric specialists



Audiologic Follow Up



- Conduct diagnostic ABR for infants who has cCMV
- Monitor hearing every 3-12 months until age 12 years

Treatment Options for Patients with cCMV

- Emerging research shows that antiviral drugs, Ganciclovir or Valganciclovir, may help newborns born with symptomatic congenital CMV.
 - prevent or lessen the severity of hearing loss
 - may improve head and brain growth
 - such as thrombocytopenia, organ failure (most commonly spleen and/or liver), hepatitis, and pneumonitis.
- Treatments generally last from 6 weeks to 6 months and are administered orally or through an IV or PICC line.
- **Treatment should be started by 4 weeks of age and must be started by 13 weeks of age. After 13 weeks of age, most doctors will not treat with the antivirals.**

Management & Treatment

AAP supports treatment with **valganciclovir** for:

- Infants with symptomatic cCMV disease, especially:
 - Central nervous system involvement
 - Significant organ disease
 - Hearing loss associated with cCMV disease

Treatment considerations:

- Typically initiated during the first month of life
- Six-month treatment course commonly recommended
- Requires monitoring for adverse effects, including neutropenia

Growing evidence supports consideration of treatment in some infants with isolated cCMV-related hearing loss, although decisions should be individualized.

Kimberlin, et al

Effect of Ganciclovir on Hearing Outcomes in Infants

6-Month Hearing Outcomes

- **Ganciclovir group:**
 - **84% (21/25)** had hearing improvement or maintained normal hearing
- **No-treatment group:**
 - **59% (10/17)** had hearing improvement or maintained normal hearing
- **Trend toward benefit** with ganciclovir ($P = 0.06$)

Hearing Deterioration at 6 Months

- **Ganciclovir:**
 - **0% (0/25)** experienced hearing deterioration
- **No treatment:**
 - **41% (7/17)** experienced hearing deterioration

Significant difference ($P < 0.01$)

Long-Term Hearing Outcomes (≥ 1 Year Follow-Up, BSER Audiometry)

- **Ganciclovir group:**
 - **21% (5/24)** had hearing deterioration in the best ear
- **Control group:**
 - **68% (13/19)** had hearing deterioration
- **Strong long-term benefit** with ganciclovir ($P < 0.01$)

Secondary Outcomes

- Improvements in weight gain
- Improvement in head circumference
- Rapid resolution of their liver function abnormalities.

- Treatments is not only antiviral medications.
- Consider treatment as Early Intervention and appropriate referrals
 - GI
 - Ophthalmology
 - Head ultrasound/MRI
 - Lab work/ blood counts
 - Developmental pediatrician

PREVENTING CMV

How to Prevent CMV

- Do Not Share Food, Utensils, Drinks or Straws
- Do Not Put a Pacifier in Your Mouth
- Avoid Contact with Saliva when Kissing a Child
- Do Not Share a Toothbrush
- Wash Your Hands-Wash your hands often with soap and water for 15-20 seconds, especially after the following activities:
 - Wiping a young child's nose or drool
 - Changing diapers
 - Feeding a young child
 - Handling children's toys

CMV is short for **cyto-megalo-virus**

CMV is preventable

 <p>Pregnant women who already have young children, or who work with young children, are at highest risk of catching CMV</p>	 <p>CMV is found in home and daycare settings</p>
 <p>Avoid contact with saliva - Kiss kids under the age of 6 on the forehead instead of lips or cheek</p>	<p>75% of toddlers have CMV in their urine or saliva in studies at child-care settings</p>
 <p>Wash your hands after contact with bodily fluids of kids under the age of 6</p>	 <p>Don't share utensils, drinks, or toothbrushes with kids under the age of 6</p>



Seeing Patient with cCMV

- **Routine Care:** Routine exclusion of pregnant staff from caring for patients with CMV is not recommended.
- **Preventive Measures:** Wash hands frequently with soap and water for 15–20 seconds, particularly after changing diapers, feeding, or wiping noses.
- **Protective Equipment:** Use gloves when handling urine or saliva and consider wearing a gown.
- **Avoid Direct Exposure:** Do not share food, drinks, or utensils, and avoid contact with saliva (e.g., kissing).

Remember...Up to 70%
of children ages 1-3
years of age in a
daycare setting are
shedding the virus.

GUIDELINES FOR CMV

Guidelines & Position Statements

- AAA/ACIA: Supports CMV screening for all infants
- JCIH: Recommends early identification and intervention for hearing loss
- CDC: Emphasizes prevention and early diagnosis of congenital CMV
- AAP: Statement released in September 2026

AAP Statement

- Strengthens rationale for cCMV testing after failed newborn hearing screening
- Supports collaboration among audiology, pediatrics, ENT, infectious disease, and early intervention
- Highlights need for rapid testing pathways before 21 days of age
- Reinforces ongoing audiologic monitoring throughout childhood
- Provides national support for state-level cCMV screening initiatives and hearing-targeted programs [\[publications.aap.org\]](https://publications.aap.org)

Challenges & Controversies

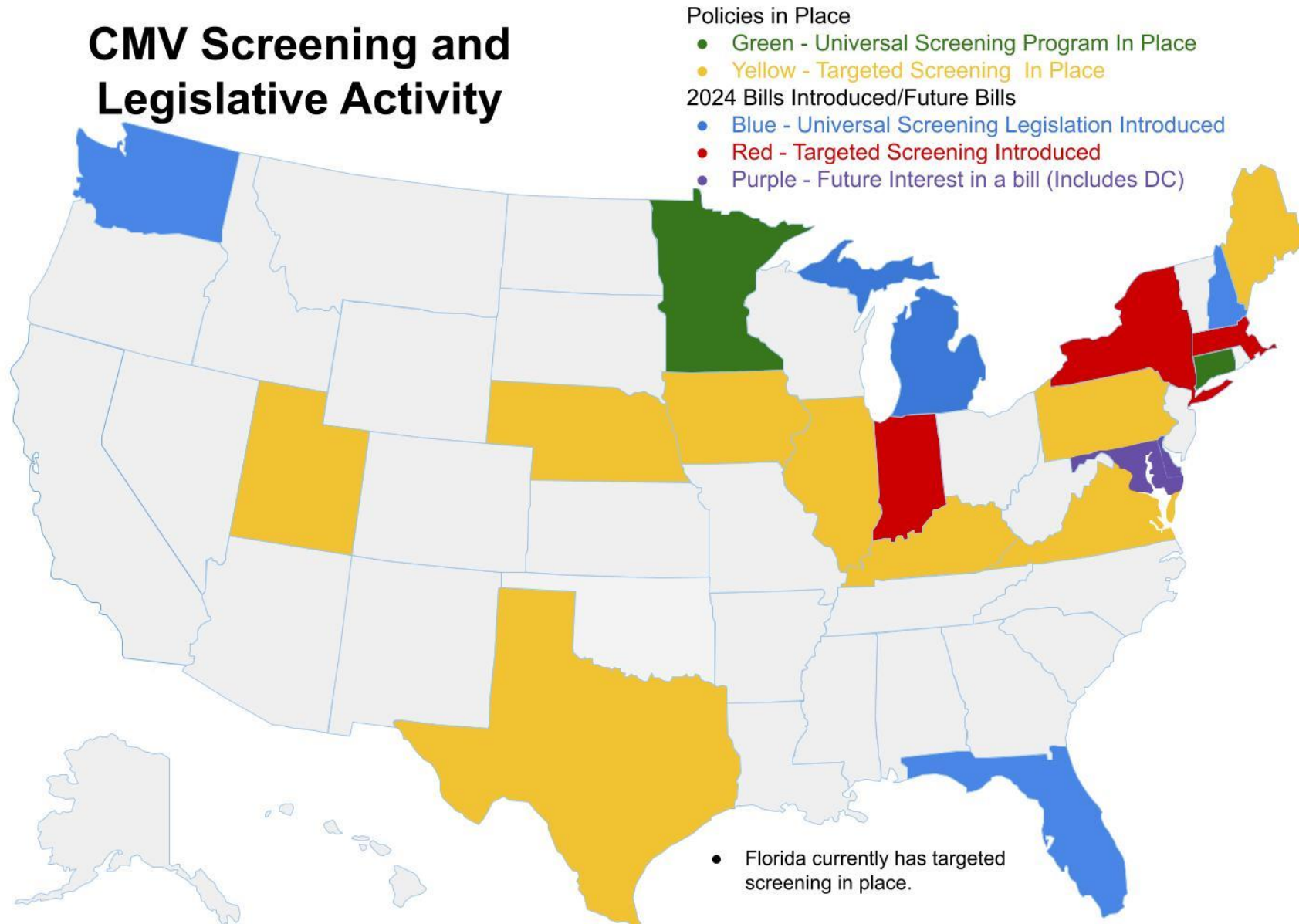
- Universal vs targeted screening debate
- Resource and cost limitations
- Ethical concerns: parental consent, anxiety, false positives
- Need for standardized protocols across states

ADVOCACY

What Other States Are Doing

- Numerous states have legislation or initiatives for CMV screening to happen in birth hospitals.
- All States who conduct screening have Targeted CMV screening except Minnesota and Connecticut. They offer universal based on DBS.
- Targeted screening in most states is based on hearing test results alone.
- Utah has expanded criteria to include other symptoms.

CMV Screening and Legislative Activity



[CMV and Hearing Loss | CMV and Cochlear Implants | ACI Alliance](#)

Bella Dawn Streeval Law

- Bella's Law passed in Kentucky in 2022.
- Under the law, any infant born in Kentucky who fails two initial objective newborn hearing screening tests, or who displays other clinical risk factors, must be tested for CMV unless the parents explicitly choose to opt out.
- It requires the Department for Public Health to provide educational resources and materials regarding CMV to expectant mothers and families to raise overall awareness of the virus and prevention strategies.



RUSP

- Recommended Uniform Screening Panel-Secretary of Health and Human Services recommends for newborn screening panel
- CMV was submitted numerous times but has not been approved.
- If approved, states will follow recommendation

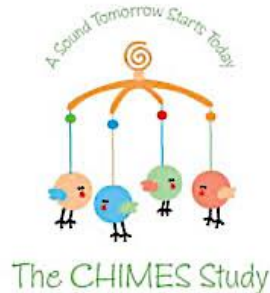
Do not pass (screened for cCMV)

- **7.0% of all infants with cCMV**
 - **5.5% in well-baby nursery**
 - **20% in NICU**

Pass (Not screened for cCMV)

93 % of all infants with cCMV

- **94.5% in well-baby nursery**
- **80% in NICU**





Key Recommendations from the AAA Position Statement

- Implement targeted or universal CMV screening for newborns who fail hearing screening.
- Promote early identification and intervention to improve outcomes.
- Encourage interdisciplinary collaboration among audiologists, pediatricians, and infectious disease specialists.

References:

Miller, TE et al. Congenital Cytomegalovirus Infection Following Second and Third Trimester Maternal Infection Is Associated With Mild Childhood Adverse Outcome Not Predicted by Prenatal Imaging <https://pubmed.ncbi.nlm.nih.gov/33393625/>

Fist, Lewis. Congenital CMV Screening: Should We Take a Universal or Targeted Approach? <https://publications.aap.org/journal-blogs/blog/2438?autologincheck=redirected?nfToken=00000000-0000-0000-0000-000000000000>

Antommarie, Armand H. Congenital Cytomegalovirus Testing and Newborn Screening Programs. <https://publications.aap.org/journal-blogs/blog/20507/Congenital-Cytomegalovirus-Testing-and-Newborn>

<https://www.nationalcmv.org/get-involved/donate.aspx>

Kimberlin, David et al Treatment of congenital cytomegalovirus infection: implications for future therapeutic strategies. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2667137/>

About Newborn Screening: The Recommended Uniform Screening Panel. <https://www.babysfirsttest.org/newborn-screening/the-recommended-uniform-screening-panel>

Thank You!