

Zika Grand Rounds Facilitation Guide: Pediatrics

Intended Audience: Pediatricians

Estimated Length: 25 minutes

<p>CDC'S Response to Zika</p> <p>Zika Virus and Infants: A Primer</p> <p>Grand Rounds</p> 	<ul style="list-style-type: none">• Good [morning/afternoon/evening]. Today I'd like to share with you what is currently known about Zika virus and infants.
<p>First time in history...</p> <p>"Never before in history has there been a situation where a bite from a mosquito could result in a devastating malformation." — Dr. Tom Frieden, CDC Director <i>Fortune</i>, April 13, 2016</p> <p>"...the last time an infectious pathogen (rubella virus) caused an epidemic of congenital defects was more than 50 years ago..." — <i>New England Journal of Medicine</i>, April 13, 2016</p> 	<ul style="list-style-type: none">• Today's Zika outbreak is unprecedented. Although Zika was first identified almost 70 years ago, the potentially devastating effects on pregnancy are a recently recognized phenomenon.• Some of you here today may remember that the last time an infectious pathogen (rubella virus) caused an epidemic of congenital defects was more than 50 years ago, before an effective vaccine became available.
<p>Today's Presentation</p> <ul style="list-style-type: none">• Zika: The Basics• Zika, Pregnancy, and Congenital Zika Syndrome• CDC Guidance: Infants with Possible Zika Virus Infection• Zika Virus and Children• What is CDC Doing?• What Can You Do?	<ul style="list-style-type: none">• My goal today is to share the most current information available, and encourage you to stay up-to-date as the science advances. Here's a brief outline of my presentation.
<p>Zika: The Basics</p>	<ul style="list-style-type: none">• First, let's start with some basics.

What is Zika virus?

- Single-stranded RNA virus
- Closely related to dengue, yellow fever, Japanese encephalitis, and West Nile viruses
- Primarily transmitted by the bite of two *Aedes* species mosquitoes
 - *Aedes aegypti* and *Aedes albopictus* mosquitoes
- Additional modes of transmission
 - Intrauterine and perinatal transmission (mother to fetus)
 - Sexual transmission
 - Laboratory exposure
 - Probable: Blood transfusion



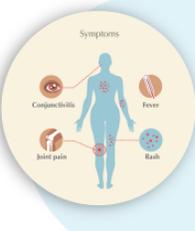
- Zika is a single-stranded RNA virus that is closely related to dengue, yellow fever, Japanese encephalitis, and West Nile viruses.
- It is primarily transmitted by the bite of two *Aedes* species mosquitoes, *Aedes aegypti* and *Aedes albopictus*.
- Zika is also transmitted through several other routes including
 - Intrauterine and perinatal transmission
 - Sexual transmission
 - Laboratory exposure
 - And probably blood transfusion



- As of December 29, 2016, 61 countries and territories worldwide are reporting active Zika virus transmission. Check the CDC website for the latest numbers and locations.
- This map shows countries in which Zika virus is actively being transmitted by mosquitoes. Orange shading of a country doesn't mean that Zika virus is being spread across the entire country; it just means that Zika virus, spread by local mosquitoes, has been reported in at least one area of that country. Visit the CDC website for more specific information about where Zika virus is being locally transmitted.
- To date, Florida and Texas are the only states in the United States that have had local transmission. This occurred in small areas in Miami-Dade County, FL and Cameron County, TX.

Signs and Symptoms

- Clinical illness is usually mild
- Most common symptoms are:
 - Fever
 - Rash
 - Joint pain
 - Conjunctivitis
- Symptoms last several days to a week
- Severe disease is uncommon
- Fatalities are rare
- Once infected, a person is likely to be protected from future infections



- Now I would like to switch gears and talk about some of the clinical aspects of Zika.
 - Many people infected with Zika virus won't have symptoms or will only have mild symptoms.
 - When symptoms do occur, the most common ones are fever, rash, joint pain, and conjunctivitis (red eyes).
 - Symptoms typically last several days to a week.
 - Severe disease requiring hospitalization has been uncommon and fatalities have been rarely reported.
 - Based on what we know from similar infections, once a person has been infected with Zika and cleared the virus from their blood, it is believed that he or she is likely to be protected from future infections.

Clinical Management

- No vaccine or specific antiviral treatment
- Treat the symptoms
 - Rest
 - Drink fluids to prevent dehydration
 - Take medicine such as acetaminophen to reduce fever and pain
 - Avoid aspirin and other non-steroidal anti-inflammatory drugs (NSAIDS) until dengue can be ruled out to reduce the risk of bleeding



- Although research is underway, there is currently no vaccine or specific antiviral treatment for Zika.
- The cornerstone of treatment is supportive care. Patients should be advised to treat the symptoms, including:
 - Rest
 - Drinking fluids to prevent dehydration and
 - Taking medicine such as acetaminophen to reduce fever and pain
 - However, aspirin and NSAIDS should be avoided until dengue can be ruled out to reduce the risk of bleeding.

Zika, Pregnancy, and Congenital Zika Infection

- When Zika virus is transmitted from a pregnant woman to her fetus, the effect on the health of the fetus and infant can be serious. We'll focus now on Zika, Pregnancy, and Congenital Zika Syndrome.

Zika Virus Infection in Pregnant Women

- Pregnant women can be infected
 - Through the bite of an infected mosquito
 - Through sex without a condom with an infected partner
- If a woman is infected around conception
 - Zika might present risk to fetus
- If infected during pregnancy
 - Zika can be passed to the fetus during pregnancy or around the time of birth



- Pregnant women can be infected with Zika through the same routes I discussed earlier, mainly
 - Through the bite of an infected mosquito or
 - Through sex without a condom with an infected partner
- Zika may be passed to the fetus early on, around the time of conception.
- If a woman is infected during pregnancy, Zika can be passed to the fetus during pregnancy or around the time of birth.

Zika Virus in Pregnancy



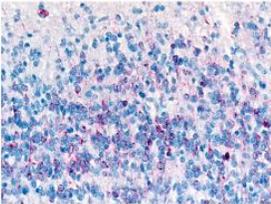
- Infection can occur in any trimester
- No evidence of increased susceptibility to Zika virus
- The clinical course is similar in pregnant women and in non-pregnant people

Centers for Disease Control and Prevention. (2016, November). *Recognizing, Reporting, and Responding to Zika Virus Infections in Travelers Returning from Central America, South America, the Caribbean and Mexico*. Retrieved from <https://www.cdc.gov/zika/ncyc/media/2016/s111616zika-recognizing-reporting-and-responding-to-zika-virus-infections-in-travelers-returning-from-central-america-south-america-the-caribbean-and-mexico-2016-11-16.html>

- Infection can occur in any trimester.
- There is no evidence that pregnant women are more susceptible to Zika virus infection than non-pregnant women, and
- The clinical course of Zika virus infection is similar for pregnant women and non-pregnant people.

CDC Lab Confirms Zika In Fetal Tissues

- Zika virus has been shown to be present in fetal tissue
- Evidence of Zika virus has been detected in
 - Amniotic fluid
 - Placenta
 - Fetal brain tissue
 - Products of conception
- Zika virus has been found to continue to replicate in infants' brains after birth (Bhatnagar et al., 2017)



Bhatnagar J, Rabeneck DB, Martines RB, Reagan Steiner S, Ermias Y, Estetter LBC, et al. Zika virus RNA replication and persistence in brain and placental tissue. Emerg Infect Dis. 2017 Mar [Epub ahead of print].

Immunohistochemical staining of Zika virus antigen (red stain) in fetal brain tissue. This staining is present in the same areas where neuronal cell death/necrosis was identified by microscopic review of tissue morphology.

- Zika virus has been shown to be present in fetal tissue.
- There is evidence of Zika virus detected in:
 - Amniotic fluid
 - Placenta
 - Fetal brain tissue
 - Products of conception
- This image shows immunohistochemical staining of Zika virus antigen (red stain) in fetal brain tissue. This staining is present in the same areas where neuronal cell death/necrosis was identified by microscopic review of tissue morphology.
- A CDC study released December 13, 2016, found that Zika virus can continue to replicate in infants' brains even after birth. This information could have important implications for Zika-exposed babies born with microcephaly and for babies who are born without visible evidence of congenital Zika infection.
 - Bhatnagar J, Rabeneck DB, Martines RB, Reagan Steiner S, Ermias Y, Estetter LBC, et al. Zika virus RNA replication and persistence in brain and placental tissue. Emerg Infect Dis. 2017 Mar [Epub ahead of print].

Zika is a Cause of Microcephaly

THE NEW ENGLAND JOURNAL OF MEDICINE

SPECIAL REPORT

Zika Virus and Birth Defects — Reviewing the Evidence for Causality

Sergio A. Ballesteros, M.D., Denise J. Jamison, M.D., M.P.H., Margaret A. Hoenes, Ph.D., M.P.H., and Lyb R. Petersen, M.D., M.P.H.

SUMMARY

The Zika virus has spread rapidly in the Americas since its first identification in Brazil in early 2015. Prenatal Zika virus infection has been linked to adverse pregnancy and birth outcomes, most notably microcephaly and other serious brain anomalies. To determine whether Zika virus infection

POTENTIAL RELATIONSHIP BETWEEN ZIKA VIRUS INFECTION AND BIRTH DEFECTS

Since the identification of the Zika virus in Brazil in early 2015, the virus has spread rapidly throughout the Americas. www.cdc.gov/zika/

- Before the current Zika outbreak, the relationship between Zika virus infection and microcephaly had not yet been confirmed.
- The initial association between Zika virus and birth defects was suspected based on the number of cases over time. But increasing evidence became available because of the recent outbreaks to investigate a causal relationship.
- In April 2016, in an article published in the New England Journal of Medicine, scientists at CDC concluded that Zika virus is a cause of microcephaly and other brain anomalies.
- To reach this conclusion, the scientists conducted a systematic evaluation of the evidence, which supported a causal relationship between Zika virus infection and microcephaly and other serious brain anomalies.

Potential Risk of Birth Defects Related to Zika

- Among pregnant women in the United States with laboratory evidence of possible Zika virus infection:
- Overall about **6%** of fetuses or infants had birth defects potentially related to Zika virus
- The proportion of pregnancies with birth defects was similar (around **6%**) among symptomatic and asymptomatic pregnant women
- Among women with infection in the 1st trimester of pregnancy, birth defects were reported in **11%** of fetuses or infants



Hornevick AL, Davison AL, Petersen EE et al. Birth Defects Among Fetuses and Infants of US Women With Evidence of Possible Zika Virus Infection During Pregnancy. JAMA. 2016 Dec 15 [Epub ahead of print].

- A report from the US Zika Pregnancy Registry found that about 6% of completed pregnancies in women with laboratory evidence of possible recent Zika virus infection had birth defects potentially related to Zika virus.
- The report also found that among women with maternal symptoms OR laboratory evidence of possible Zika virus infection in the first trimester of pregnancy, birth defects were reported in 11% of completed pregnancies.
- The proportion of pregnancies with birth defects was similar (around 6%) among pregnant women who experienced symptoms and pregnant women who were asymptomatic. This emphasizes the importance of screening pregnant women for Zika risk and testing them when indicated, because asymptomatic women are just as likely to have babies with birth defects.
- These data suggest that Zika virus infection during the first trimester of pregnancy poses danger to pregnancy and fetal development. There is not enough data to estimate the risk for pregnancies infected in the 2nd or 3rd trimester. There are some limitations of this study, noted here, including that some pregnancies are ongoing, and microcephaly cases are still being reported and investigated.

Congenital Zika Syndrome

- Pattern of congenital anomalies associated with Zika virus infection during pregnancy that includes
 - Severe microcephaly (small head size) resulting in a partially collapsed skull
 - Thin cerebral cortices with subcortical calcifications
 - Eye anomalies, including macular scarring and focal pigmentary retinal mottling
 - Congenital contractures or limited range of joint motion
 - Marked early hypertonia, or too much muscle tone, and symptoms of extrapyramidal involvement
- Infants with normal head circumference at birth may:
 - Have brain abnormalities consistent with congenital Zika syndrome
 - Develop microcephaly after birth



- Congenital Zika syndrome is a recognizable pattern of congenital anomalies associated with Zika virus infection during pregnancy that includes:
 - Severe microcephaly (small head size) resulting in a partially collapsed skull
 - Thin cerebral cortices with subcortical calcifications
 - Eye anomalies, including macular scarring and focal pigmentary retinal mottling
 - Congenital contractures or limited range of joint motion
 - Marked early hypertonia, or too much muscle tone, and symptoms of extrapyramidal involvement
- Infants with a head circumference at birth in the normal range can have brain abnormalities consistent with congenital Zika syndrome.
 - In addition, microcephaly from congenital Zika infection can develop after birth.

Potential Risk of Microcephaly

- 1- 13% estimated risk of microcephaly due to Zika virus infection in first trimester
 - Modeling based on current outbreak in Bahia, Brazil
 - Not enough data to estimate 2nd or 3rd trimester risk
- *Important to remember*
 - Data are limited (infection rates unknown; microcephaly cases still being reported)
 - Microcephaly is difficult to detect prenatally
 - Microcephaly is only one of a range of possible adverse outcomes



Johansson MA, Miller F, Tapan-Ronero L, Reefhuis L, Gilboa SM, Hills J. Zika and the Risk of Microcephaly. *N Engl J Med*. 2016 May 25 [Epub ahead of print].

- We don't yet know the risk of microcephaly in infants of mothers who were infected with Zika virus during pregnancy, but we are learning more information.
- Based on risk models from the current outbreak in Brazil, the estimated risk of microcephaly was 1-13% when the Zika infection occurred in the first trimester of pregnancy.
- Currently there are not enough data to estimate the risk when the infection occurs in the 2nd or 3rd trimester.
- There are some limitations of this study, noted here, including that some pregnancies are ongoing, and microcephaly cases are still being reported and investigated.

Congenital Zika Syndrome without Microcephaly at Birth

- Microcephaly from congenital infection can occur after birth
- The full spectrum of poor outcomes caused by Zika virus infection during pregnancy remains unknown



Linden V, Passouf A, Odoyn WB, et al. Description of 13 Infants Born During October 2015–January 2016. *MMWR*. 22 Nov 2016.

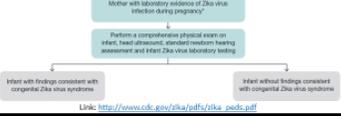
- On November 22nd, 2016 *CDC* published a report describing 13 infants in Brazil with laboratory evidence of congenital Zika virus infection and normal head size at birth. All had brain anomalies consistent with congenital Zika syndrome.
- All infants showed a decrease in the rate of head circumference growth and postnatal microcephaly was diagnosed in 11 of 13 infants by the end of their first year.
- This case series illustrates
 - that microcephaly at birth is not a necessary feature of CZS
 - the variety of clinical presentations that congenital Zika infection can produce, and
 - the importance of neuroimaging in evaluating infants with congenital Zika virus exposure.
- Research to describe the full spectrum of adverse reproductive outcomes caused by Zika virus infection is ongoing.

CDC Guidance: Infants with Possible Congenital Zika Virus Infection

- Now, I will speak about CDC's guidance regarding infants with possible Zika virus infection.

Infants with Possible Congenital Zika Virus Infection

- Testing of infants with possible congenital Zika virus infection should be guided by
 - Whether the infant has abnormalities consistent with congenital Zika syndrome
 - The mother's Zika virus testing results
- Congenital Zika virus infection can be diagnosed by RNA nucleic acid testing (NAT) and through serologic testing
- All infants should have a comprehensive physical exam and head ultrasound before discharge from the hospital regardless of the presence or not of abnormalities and prenatal ultrasound results



Link: http://www.cdc.gov/zika/pdf/zika_peds.pdf

- All infants born to mothers with laboratory evidence of congenital Zika virus infection during pregnancy, and infants born infants with findings suggestive of congenital Zika syndrome and a maternal epidemiologic link suggesting possible transmission, regardless of maternal testing results, should receive: a comprehensive physical exam (including a neurologic exam, a postnatal head ultrasound, a standard newborn hearing screen), and lab testing for Zika virus.
- A postnatal head ultrasound should be performed on all infants born to mothers with laboratory evidence of Zika virus infection before discharge from the hospital. This should include those infants with normal prenatal ultrasound findings, because some abnormal findings associated with congenital Zika syndrome might not be readily apparent on prenatal ultrasounds.

Infants with Possible Congenital Zika Virus Infection

Recommendations for follow-up depend on whether the infant has abnormalities consistent with congenital Zika syndrome



Link: <http://www.cdc.gov/zika/pdf/pediatric-evaluation-follow-up-tool.pdf>

- Recommendations for follow up after initial screening and testing depend on whether the infant has abnormalities consistent with congenital Zika infection.

Initial Evaluation

Infants with abnormalities consistent with congenital Zika syndrome born to a mother with lab evidence of Zika

- Before hospital discharge:
 - ✓ Routine newborn care: physical exam, including occipitofrontal (head) circumference, weight, length, a neurologic exam, and universal hearing screen
 - ✓ Head ultrasound
 - ✓ Testing for congenital Zika virus infection
 - ✓ Complete blood count, metabolic panel and liver enzyme testing
 - ✓ Consult with multiple subspecialists
 - ✓ Referral for comprehensive eye exam by an ophthalmologist
 - ✓ Referral for auditory brainstem response (ABR) hearing evaluation
 - ✓ Consider advanced cranial imaging (e.g., MRI)
 - ✓ Consider transfer to hospital with specialty care
- Refer for a comprehensive ophthalmologic exam and evaluation of hearing by ABR testing before 1 month of age

Link: <https://www.cdc.gov/mmwr/volumes/15/rr/mm1536a2.html>

- The initial exam of an infant with abnormalities consistent with congenital Zika syndrome, born to a mother with lab evidence of Zika, should occur before hospital discharge and include
 - All the components of routine newborn care, which include a physical exam, including head circumference, weight, length, and a neurologic exam, hearing screen per universal screening recommendations
 - A head ultrasound
 - Specimen testing for congenital Zika virus infection
 - Complete blood count, metabolic panel and liver enzyme testing
 - It may be necessary to consult with multiple subspecialists as clinically indicated
 - Referral for comprehensive eye exam by an ophthalmologist before 1 month of age
 - Referral for a hearing evaluation using auditory brainstem response (ABR) prior to 1 month of age
- Advanced cranial imaging, such as an MRI, and transfer to a hospital that can provide subspecialty care should also be considered as clinically indicated.

	<ul style="list-style-type: none"> You can read the full infant guidance on CDC’s MMWR website.
<p>Consult with Specialists Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika</p> <ul style="list-style-type: none"> • Neurologist to determine appropriate neuroimaging and additional evaluation • Infectious disease specialist to evaluate other congenital infections • Ophthalmologist to examine the eye and evaluate for possible cortical visual impairment prior to discharge from hospital or within 1 month of birth • Endocrinologist to evaluate for hypothalamic or pituitary dysfunction • Clinical geneticist to evaluate for other causes of microcephaly or other anomalies if present 	<ul style="list-style-type: none"> For infants with abnormalities consistent with congenital Zika syndrome AND lab evidence of Zika, the following specialists should be consulted based on clinical indication prior to hospital discharge to assist in the management of care: <ul style="list-style-type: none"> ○ Neurologist ○ Infectious disease specialist ○ Ophthalmologist ○ Endocrinologist ○ Clinical geneticist Before hospital discharge, follow-up appointments with specialists and services recommended during initial evaluation should be made.
<p>Consult with Specialists Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika</p> <p>Consultation with the following should also be considered:</p> <ul style="list-style-type: none"> • Orthopedist, physiatrist, and physical therapist to manage hypertonica, club foot, or arthrogryptic-like conditions • Pulmonologist or otolaryngologist to consult about aspiration • Lactation specialist, nutritionist, gastroenterologist, or speech or occupational therapist to manage feeding issues 	<ul style="list-style-type: none"> Clinicians should also consider consulting with <ul style="list-style-type: none"> ○ Orthopedist, physiatrist, and physical therapist ○ Pulmonologist or otolaryngologist ○ Lactation specialist, nutritionist, gastroenterologist, or speech or occupational therapist depending on clinical indication
<p>Outpatient Management Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika</p> <ul style="list-style-type: none"> • Establish a medical home to facilitate coordination of care • Provide routine preventive pediatric health care, including immunizations and monthly primary care visits for at least the first 6 months • Conduct developmental monitoring at each routine visit • Complete neurologic exam at age 1 and 2 months, then as needed • Refer patients to developmental specialist and early intervention services • Repeat ophthalmology exam with retinal assessment at 3 months • Repeat ABR hearing assessment at age 4–6 months • Conduct thyroid screening at age 2 weeks and age 3 months • Provide family support services • Provide appropriate referrals 	<ul style="list-style-type: none"> The care of infants with abnormalities consistent with congenital Zika syndrome requires a multidisciplinary team and an established medical home to facilitate the coordination of care. Outpatient management of an infant with congenital Zika syndrome AND lab evidence of congenital Zika syndrome includes: <ul style="list-style-type: none"> ○ Working with families to establishing a medical home to facilitate coordination of care ○ Providing routine preventive pediatric health care, including immunizations ○ Conducting developmental monitoring at each routine visit ○ Completing a neurologic exam at age 1 and 2 months, then as needed ○ Referral to developmental specialist and early intervention services as needed ○ Repeat ophthalmology exam with retinal assessment at 3 months ○ Repeat ABR hearing assessment at age 4–6 months ○ Thyroid screening at age 2 weeks and age 3 months ○ Providing family support as needed

Initial Evaluation & Outpatient Management

Infants with lab evidence of Zika and without abnormalities consistent with congenital Zika syndrome

- Before hospital discharge infants should receive
 - Routine care including monitoring of occipitofrontal circumference, length, and weight
- Outpatient management includes routine follow up and:
 - Establish medical home
 - Perform vision screening at every well child visit
 - Evaluate hearing: consider repeat ABR testing at 4–6 months or perform behavioral diagnostic testing at age 9 months if ABR is not done at 4–6 months
 - Provide referrals: Any children with identified or suspected delays should be referred to a developmental specialist or early intervention programs
 - Provide family support services, such as counseling, as needed

- Before hospital discharge, infants with laboratory evidence of Zika infection but without apparent abnormalities at birth are recommended to have additional monitoring until further information is available regarding outcomes, because some neurologic sequelae of congenital Zika infection might be subtle or have delayed onset.
- An infant who is born with lab evidence of congenital Zika infection but without findings consistent with congenital Zika syndrome should receive:
 - Routine newborn care including monitoring of head (occipitofrontal) circumference, length, and weight
- Outpatient management of these infants includes:
 - Routine infant follow up
 - Work with the family to establish a medical home for the infant.
 - Developmental monitoring at every visit, and age-appropriate standardized validated developmental screening at 9 months
 - Emphasize anticipatory guidance for families regarding developmental milestones, feeding and growth, sleep and irritability, and abnormal movements.
 - Vision screening and assessment of visual regard should be performed at every well child visit.
 - To evaluate hearing, consider repeat ABR testing at 4–6 months or perform behavioral diagnostic testing at age 9 months if ABR is not done at 4–6 months.
 - Referral to a developmental specialist and early intervention programs should be considered as soon as caregiver or provider concerns are noted.
 - Family and support services should be provided as needed.

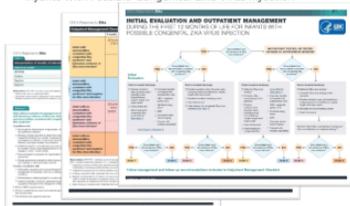
Family and Psychosocial Support

- Families and caregivers of infants with congenital Zika virus infection may require ongoing psychosocial support.
- Families should be empowered to be active participants in their child's monitoring and care.
- Healthcare providers should work closely with parents to ensure that the care plan is consistent with the infant's needs and the family's wishes.
- Families with already limited access to medical care might be affected with a disproportionate burden of Zika virus infection.
- Barriers to care for all affected infants and their families should be addressed by linking them with national, state, and local health programs as well as social services.
- Additional resources for families can be found at: <http://www.cdc.gov/zika/parents/families-of-newborns-affected-zika.html>

- Families and caregivers of infants with congenital Zika virus infection may require ongoing psychosocial support.
 - Families should be empowered to be active participants in their child's monitoring and care.
 - Healthcare providers should work closely with parents to ensure that the care plan is consistent with the infant's needs and the family's wishes.
 - Families with limited access to medical care may also face additional challenges, for example, language and cultural barriers, financial barriers, and inadequate healthcare access
 - In areas with limited access to pediatric subspecialty care, the numerous services recommended for infants with congenital Zika syndrome might not be readily available; in these situations, telehealth might be explored as a potential means of providing subspecialty care and support
 - Barriers to care for all affected infants and their families should be addressed through links to national, state, and local health programs, as well as social services.
 - Additional resources for families are available on the CDC website.

Pediatric Evaluation and Follow-up Tools

Initial Evaluation and Outpatient Management During the First 12 Months of Life for Infants with Possible Congenital Zika Virus Infection



Download at:
<http://www.cdc.gov/zika/pdfs/pediatric-evaluation-follow-up-tool.pdf>

- This guidance on evaluation and outpatient management has also been summarized in a tool or pocket guide for clinicians. You can download this from the CDC website.

Zika Virus and Caring for Infants and Children

- As I mentioned, Zika virus infection has serious potential health implications for pregnant women and their fetuses. Let's continue to discuss information and tips regarding infants and caregivers.

Infants with Possible Postnatal Zika Virus Infection

- [Guidance for testing and clinical management](#) of infants and children with postnatal Zika virus infection is in line with testing and clinical management recommendations for adults.
- [Symptomatic treatment and supportive care](#) are appropriate and usually sufficient to treat Zika. Special considerations to treat children with Zika include
 - Aspirin should never be used to treat children with symptoms of acute viral illness because of the risk of Reye's syndrome.
 - All non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided in children <6 months.

- In regard to testing and clinical management of infants and children with postnatal Zika virus infection, the guidance is in line with testing and clinical management recommendations for adults.
- Treating the symptoms and providing supportive care are appropriate and usually sufficient to treat Zika. Treatment can include rest, fluids, and use of analgesics and antipyretics.
- Because of similar geographic distribution and symptoms, patients with suspected Zika virus infections also should be evaluated and managed for possible dengue or chikungunya virus infection.
- Special considerations to treat children with Zika include:
 - Aspirin should never be used to treat children with symptoms of acute viral illness because of the risk of Reye's syndrome.
 - All non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided in children <6 months.
- Aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided until dengue can be ruled out to reduce the risk of hemorrhage.

Zika and Breastfeeding

- Transmission of Zika virus through breast milk has not been documented.
- Benefits of breastfeeding outweigh theoretical risk of Zika virus transmission through breast milk
- CDC and the World Health Organization recommend that infants born to women with suspected, probable, or confirmed Zika virus infection, or who live in or have traveled to areas of Zika, should be fed according to usual infant feeding guidelines.



- There are currently no cases of Zika virus transmission associated with breastfeeding that have been reported.
- Zika virus RNA has been identified in breast milk; but based on the current evidence, the benefits of breastfeeding outweigh the theoretical risks of Zika virus transmission through breastmilk.
 - There's no evidence that it can be transmitted from mother to child through breastfeeding.
- CDC and the World Health Organization recommend that infants born to women with possible or confirmed Zika virus infection, or who live in or have traveled to areas of Zika, should be fed according to usual infant feeding guidelines.

Tips for Parents and Caregivers

- Dress your child in clothing that covers arms and legs.
- For children older than 2 months, use insect repellent on exposed skin.
 - » Do not use insect repellent on babies younger than 2 months old.
- Cover crib, stroller, and baby carrier with mosquito netting.



- To help prevent Zika virus infections in children, parents and caregivers living in or visiting areas with active Zika transmission should
 - Dress their children in clothing that covers arms and legs.
 - For children older than 2 months, use insect repellent on exposed skin.
 - Do not use insect repellent on babies younger than 2 months old.
 - Cover a child's crib, stroller, and baby carrier with mosquito netting.

Tips for Parents and Caregivers

Adults applying insect repellent for babies and children

- Do not apply repellent onto hands, eyes, mouth, and cut or irritated skin.
- Spray onto your hands and then apply to a child's face.
- Do not use products containing oil of lemon eucalyptus or para-menthane-diol on children younger than 3 years old.



- Remind parents that when applying EPA-approved insect repellent, they should follow these rules:
 - Do not use insect repellent on babies younger than 2 months.
 - Do not apply repellent onto hands, eyes, mouth, or cut or irritated skin.
 - Adults should spray the repellent onto your hands and then apply to a child's face.
 - Do not use products containing oil of lemon eucalyptus or para-menthane-diol on children younger than 3 years old.

Resources for Healthcare Providers

- Caregivers of children with Zika-related complications are often overwhelmed and may need support, guidance, and help establishing a medical home.
- Healthcare providers should work closely with and empower parents and families to monitor their infant's development and determine what choices are available and how to best care for their infant's condition and needs.
- [Resources and guidance for healthcare providers caring for infants affected by Zika virus](http://www.cdc.gov/zika/hc-providers/infants-children/resources-hc-providers-caring-for-infants.html) are available on the CDC website.

<http://www.cdc.gov/zika/hc-providers/infants-children/resources-hc-providers-caring-for-infants.html>

- Like some other parents of children with disabilities, caregivers of children with Zika-related complications are often overwhelmed and may need support, guidance, and help establishing a medical home.
- Healthcare providers should work closely with and empower parents and families to monitor their infant's development and to determine what choices are available and how to best care for their infant's condition and needs.
- Resources and guidance for healthcare providers caring for infants affected by Zika virus are available on the CDC website.

Resources for Families



For more resources to share with families visit <http://www.cdc.gov/zika/posters/index.html>. Available in English, Spanish and other languages.

- Additional resources are shown here that may be helpful for healthcare providers and staff working in communities, such as home visitors and early educators, regarding Zika. These are available in Spanish and other languages as well.

What is CDC Doing?

- Now let's discuss current steps CDC is taking.

Many Questions Remain

- What is the level of risk from a Zika virus infection during pregnancy?
- When during pregnancy does Zika virus infection pose the highest risk to the fetus?
- What is the full range of potential health problems that Zika virus infection may cause?
- What other factors (e.g., co-occurring infection, nutrition, symptomatic vs. asymptomatic) might affect the risk for birth defects?
- What is the risk for later health problems in an infant who is infected or who has had exposure to Zika virus but is born without abnormalities?



- Our understanding of Zika virus continues to evolve. Although we have learned about the association of Zika and poor pregnancy outcomes in a short amount of time, many questions remain.
- For example:
 - What is the level of risk from a Zika virus infection during pregnancy?
 - When during pregnancy does Zika virus infection pose the highest risk to the fetus?
 - What is the full range of potential health problems that Zika virus infection may cause?
 - What other factors (e.g., co-occurring infection, nutrition, symptomatic vs. asymptomatic) might affect the risk for birth defects?
 - What is the risk for later health problems in an infant who is infected or who has had exposure to Zika virus but is born without abnormalities?
- Answering these critical questions is a focus of ongoing CDC research and may help improve prevention efforts and ultimately help reduce the effects of Zika infection during pregnancy.

Collecting Data for Action

Surveillance of Zika and its Effects on Pregnant Women, Infants, & Children



- This slide lists some of what CDC is doing to learn more about Zika infection during pregnancy.
 - CDC established the US Zika Pregnancy Registry in collaboration with state, tribal, local, and territorial health departments in the United States and US Territories (excluding Puerto Rico). The registry collects information about women with laboratory evidence of possible Zika virus infection during pregnancy, whether or not they have symptoms, and their infants.
 - CDC collaborated with the Puerto Rico Department of Health to develop a similar system in Puerto Rico, the Zika Active Pregnancy Surveillance System.
 - Additionally, enhanced surveillance of pregnant women with Zika in Colombia has been established.
 - CDC has funded 45 jurisdictions in the US to establish or enhance Zika-related birth defects surveillance systems that monitor brain abnormalities, including microcephaly, and central nervous system defects, to better understand Zika exposure during pregnancy and adverse outcomes.
 - CDC manages the collection of data through ArboNET in collaboration with state and territorial health departments. ArboNET is a national arboviral surveillance system that collects information on laboratory-confirmed Zika virus disease cases reported from US states and territories, including

Puerto Rico the US Virgin Islands, and American Samoa. The data from this system can help us understand the effects of postnatal Zika infection.

- Data will be used to update recommendations for clinical care, plan for services for pregnant women, their infants and families affected by Zika, and improve prevention of Zika infection during pregnancy.

Sharing Up-to-Date Information

- Providing updated clinical guidance
- Responding to your inquiries:
 - Email: ZikaMCH@cdc.gov
 - Zika Pregnancy Hotline: 770-488-7100
 - CDC-INFO: (800-232-4636)

<http://www.cdc.gov/zika>

MMWR Morbidity and Mortality Weekly Report
Volume 64, Number 11 — March 23, 2015

Update: Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Exposure — United States, July 2016

- CDC is rapidly translating new findings into public health action, messages for the public and updated clinical guidance. CDC is committed to sharing what we know when we know it.
- To that end, CDC has published updated clinical guidelines for healthcare providers caring for pregnant women, infants, and children with possible Zika virus infection, as well as other guidance relating to children’s well-being such as for schools and camps. These guidelines are available on CDC’s website and are updated as new information becomes available.
- In addition, CDC maintains a 24/7 Zika Pregnancy Hotline for healthcare providers of pregnant patients with possible Zika virus infection. Through this service, CDC scientists and clinicians are available for any concerns about clinical management and to answer questions about the US Zika Pregnancy Registry by telephone or email consultation.
- Providers and the general public can also ask questions through CDC INFO at 800-CDC-INFO (800-232-4636) or www.cdc.gov/cdc-info.

Developing Tools for Healthcare Providers

VIDEO: How to MEASURE HEAD CIRCUMFERENCE

ZIKA VIRUS: COLLECTING THE SAMPLES OF SPECIMENS FOR ZIKA VIRUS TESTING AT THE VIRUS

Specimen Collection and Submission at Time of Birth

www.cdc.gov/zika

*Free materials available in English, Spanish and other languages

- As I briefly mentioned earlier, CDC is also continuously developing additional guidance tools for healthcare providers. Examples include the Measuring Head Circumference guidelines and Specimen Collection and Submission at Time of Birth guidelines depicted here. There are clinical guidelines for specific groups and other clinical decision making tools available online.

<p>What Can You Do?</p>	<ul style="list-style-type: none"> • Here are some steps you can take to help.
<p>Report Confirmed or Probable Cases of Zika</p> <ul style="list-style-type: none"> • Zika virus infection and disease are nationally notifiable conditions. • Healthcare providers should report laboratory-confirmed and symptomatic cases of Zika to the local, state or territorial health department which in turn should report the case ArboNET. 	<ul style="list-style-type: none"> • In February 2016, Zika virus disease and congenital Zika virus infections became nationally notifiable conditions in the United States. • Healthcare providers should report laboratory-confirmed and symptomatic (probable) cases of Zika virus to their local, state or territorial health department. • State or local health departments are encouraged to report laboratory-confirmed cases to ArboNET, CDC's national arboviral diseases surveillance system • Cases in pregnant women with laboratory evidence of Zika virus infection who have either 1) symptomatic infection or 2) asymptomatic infection with diagnosed complications of pregnancy can be reported as cases of Zika virus disease to ArboNET, CDC's national arboviral diseases surveillance system.
<p>Report Cases to US Zika Pregnancy Registry</p> <ul style="list-style-type: none"> • Healthcare providers are encouraged to report and actively monitor pregnancies and congenital outcomes among symptomatic and asymptomatic women with laboratory evidence of possible Zika virus infection • More information <ul style="list-style-type: none"> • Available on the US Zika Pregnancy Registry website (http://www.cdc.gov/zika/hc-providers/registry.html) • To contact CDC Registry staff, call the CDC Emergency Operations Center watch desk at 770-488-7100 and ask for the Zika Pregnancy Hotline or email ZIKAPregnancy@cdc.gov • For non-urgent requests, call 800-CDC-INFO (800-232-4636) 	<ul style="list-style-type: none"> • In February 2016, CDC, in collaboration with state, local, tribal, and territorial health departments, launched a comprehensive surveillance system, US Zika Pregnancy Registry, to report and actively monitor pregnancies and congenital outcomes among symptomatic and asymptomatic women with laboratory evidence of possible Zika virus infection • USZPR casts a wider net than ArboNET and National Notifiable Diseases Surveillance System as it pertains to Zika, because the registry includes symptomatic and asymptomatic pregnant women with positive, equivocal, or inconclusive Zika test results with or without symptoms. It also includes all infants born to these women, not only those with identified congenital infection, and they will be followed for 1 year.

- Healthcare providers are encouraged to work with their local, state or territorial health department to report cases and collect clinical and follow-up information. This includes:
 - Laboratory-confirmed cases of Zika virus disease
 - Cases in pregnant women with laboratory evidence of Zika virus infection who have either 1) symptomatic infection or 2) asymptomatic infection with diagnosed complications of pregnancy.
 - Cases of congenital Zika virus infection in infants that include microcephaly, intracranial calcifications or other central nervous system abnormalities.
 - Cases in pregnant women with laboratory evidence of Zika virus, with and without a history of symptoms (USZPR and ZAPSS).
 - Infants born with or without abnormalities consistent with CZS and laboratory evidence of Zika virus infection
- Healthcare providers can also support the registry by spreading the word about its importance.

In Summary

- Know the basics about Zika transmission in your community
- Diagnose and test for Zika for those with symptoms in your community
- Understand the assessment and management of Zika among pregnant women and infants
- Recommend Zika prevention behaviors
- Provide support for families of infants affected by Zika
- Inform your local or state health department to help keep ArboNET and the US Zika Pregnancy Registry up-to-date

- Here are a few bulleted key takeaways from this presentation:
- Know the basics about Zika transmission in your community
- Stay up to date on Zika transmission and where it is being spread
 - Test people with symptoms of Zika and pregnant women exposed to Zika regardless of the presence of symptoms.
 - Understand the assessment and management of Zika among pregnant women and infants
 - Work with patients to help them understand how to prevent Zika
 - Provide support for families of infants affected by Zika
 - Inform your local or state health department to help CDC monitor Zika and its effects.



- Additional information and resources can be found on the CDC website.



- All of this is the work of many people. Many thanks to all of our collaborators, and thank you all for listening today.

Frequently Asked Questions

How many cases of microcephaly or other birth defects potentially linked to Zika virus infection have occurred in US states?

For up-to-date case counts visit <https://www.cdc.gov/zika/geo/pregnancy-outcomes.html>

Where can I find information about areas with Zika?

This information is available at [Areas with Zika: https://www.cdc.gov/zika/geo/index.html](https://www.cdc.gov/zika/geo/index.html)

What should providers consider when determining whether the mother of an infant has been exposed to Zika virus infection?

Each clinical scenario is unique, and healthcare providers should consider all available information when ordering a test for Zika virus infection, including patient travel history or possible exposure through sexual contact, history of flavivirus infection, vaccination history, ultrasound findings, and the presence of symptoms. Providers should work with their state, local, and territorial health departments for assistance obtaining and interpreting test results.

How can clinicians get help with testing?

Healthcare providers should work closely with their state, local, or territorial health department to ensure that the appropriate test is ordered and interpreted correctly. In addition, CDC maintains a 24/7 Zika consultation service for health officials and healthcare providers caring for pregnant women. To contact the service, call 770-488-7100 and ask for the Zika Pregnancy Hotline or email ZIKAMCH@cdc.gov.

How is Zika spread?

- Zika virus is spread to people primarily through the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*).
- A pregnant woman can pass Zika virus to her fetus during pregnancy or around the time of birth. We do not know how often this happens.
- A person with Zika virus can pass it to his or her sex partners.
- Zika may be spread through blood transfusion.
- One case of Zika has been confirmed in a person in Utah with no known risk factors; however, the person did provide care to another person who had very high amounts of Zika virus in his blood. Although the route of transmission is not certain, family contacts should be aware that blood and body fluids of severely ill patients might be infectious.
- Transmission of Zika virus infection through breastfeeding has not been documented.

What should healthcare personnel do to avoid spreading Zika virus in healthcare settings?

CDC released a [report](#) emphasizing the importance of healthcare personnel following practices, called Standard Precautions, to prevent the spread of infectious diseases such as Zika when caring for all patients, including pregnant patients in labor and delivery settings. Currently, there are no confirmed reports of Zika spreading from an infected patient to a healthcare provider or other patients. However, healthcare personnel are reminded to use Standard Precautions when they might come in contact with high volumes of body fluids. Standard Precautions to minimize contact with body fluids are important to reduce the possibility of spreading infectious diseases such as Zika.