Red Book®

Pediatric Infectious Diseases Clinical Decision Support Chart

Editor
David W. Kimberlin, MD, FAAP

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Introduction

With each new edition, the recommendations in the American Academy of Pediatrics (AAP) *Red Book* are refined and enhanced to enable physicians to provide the best possible care to children presenting with infectious diseases. The comprehensive text is notably supplemented by a growing assortment of tables, algorithms, charts, and graphs, many of which have become popular features among the readership. Physicians have even been known to make photocopies of their favorite items to post on their office walls or desktops for easy reference.

This speaks to an important need: Visual resources can be crucial at the point of care, and the format of a 1,200-page, 6" x 9" paperback book does not always do great favors for their accessibility. To make these resources more accessible and user-friendly at the point of care, I am pleased to introduce the *Red Book Pediatric Infectious Diseases Clinical Decision Support Chart*.

This brand-new resource collects many of the most clinically useful tables, algorithms, and other items from the latest edition of the *Red Book* and presents them in an enlarged, enhanced, colorized format that is lightweight, portable, and easy to navigate. Each item has been thoughtfully re-rendered to take best advantage of the larger format and more dynamic visual palette. Additionally, several new tables have been created exclusively for this chart, synthesizing important clinical information from throughout the *Red Book* text.

The content featured in these 15 information-rich tabs is derived directly from the 2018 *Red Book,* and has been reviewed by the *Red Book* editors to ensure consistency with AAP policy. Because this is a new product, we are interested in hearing how it is used by physicians in practice. We encourage you to let us know which items you find most helpful day to day, which could be further refined, and which topics you wish would be covered in future editions. This clinical decision support chart has been created with daily practice at top of mind; with your help, we look forward to creating a resource that is truly responsive to the needs of physicians.

David W. Kimberlin, MD, FAAP
Editor, Red Book

Contents

American Academy of Pediatrics Publishing Staff

Mary Lou White, *Chief Product and Services Officer/SVP, Membership, Marketing, and Publishing*
Mark Grimes, *Vice President, Publishing*
Chris Wiberg, *Senior Editor, Professional/Clinical Publishing*
Theresa Wiener, *Production Manager, Clinical and Professional Publications*
Jennifer Shaw, *Senior Medical Copy Editor*
Linda Diamond, *Manager, Art Direction and Production*
Linda Smessaert, MSIMC, *Senior Marketing Manager, Professional Resources*

Published by the American Academy of Pediatrics
345 Park Blvd
Itasca, IL 60143
Telephone: 630/626-6000
Facsimile: 847/434-8000
www.aap.org

The American Academy of Pediatrics is an organization of 67,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to the health, safety, and well-being of infants, children, adolescents, and young adults.

The recommendations in this publication do not indicate an exclusive course of treatment or serve as a standard of care. Variations, taking into account individual circumstances, may be appropriate.

Statements and opinions expressed are those of the authors and not necessarily those of the American Academy of Pediatrics.

Listing of resources does not imply an endorsement by the American Academy of Pediatrics (AAP). The AAP is not responsible for the content of external resources. Information was current at the time of publication.

Brand names are furnished for identification purposes only. No endorsement of the manufacturers or products mentioned is implied.

The publishers have made every effort to trace the copyright holders for borrowed material. If they have inadvertently overlooked any, they will be pleased to make the necessary arrangements at the first opportunity.

This publication has been developed by the American Academy of Pediatrics. The authors, editors, and contributors are expert authorities in the field of pediatrics. No commercial involvement of any kind has been solicited or accepted in the development of the content of this publication.

Every effort is made to keep *Red Book Pediatric Infectious Diseases Clinical Decision Support Chart* consistent with the most recent advice and information available from the American Academy of Pediatrics.

Special discounts are available for bulk purchases of this publication. E-mail Special Sales at aapsales@aap.org for more information.

© 2019 American Academy of Pediatrics

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise—without prior written permission from the publisher (locate title at http://ebooks.aappublications.org and click on © Get permissions; you may also fax the permissions editor at 847/434-8780 or e-mail permissions@aap.org).

Printed in the United States of America
9-415/2018 1 2 3 4 5 6 7 8 9 10
MA0914
ISBN: 978-1-61002-305-4
eBook: 978-1-61002-306-1

Our ***Red Book*** **family of products** offer comprehensive, practical, highly visual guidance to effectively overcome the latest clinical infectious disease challenges.

Red Book®: A Quick Diagnosis Deck

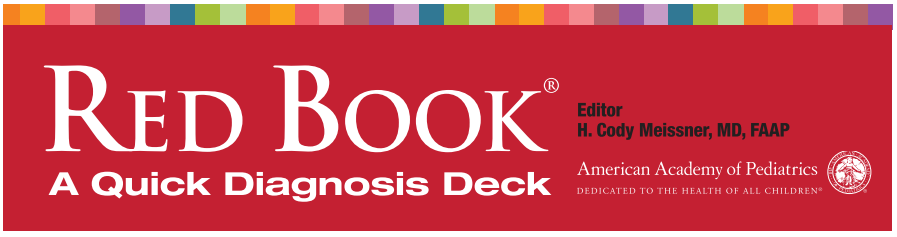
NEW!

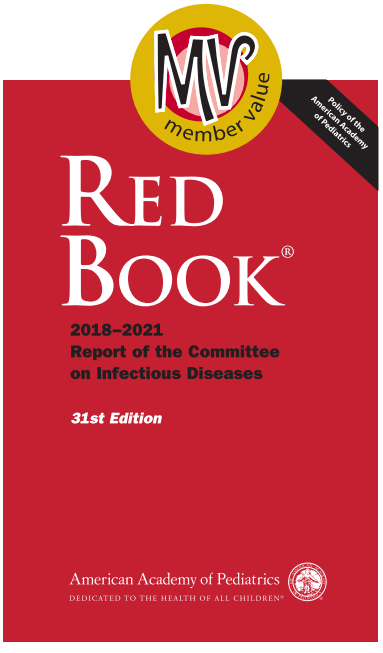
Editor: H. Cody Meissner, MD, FAAP

This innovative deck features current *Red Book*® Clinical Manifestations content with a wide range of complementary images, in a convenient and portable deck format. Now you can take advantage of all the rich information the *Red Book*® and Red Book® Online have to offer, in an easy-to-use clinical aid that fits in your coat pocket.

Deck—available April 2019
MA0921
Book ISBN 978-1-61002-313-9

Price: $67.95
Member Price: $53.95





Red Book®: 2018–2021 Report of the Committee on Infectious Diseases, 31st Edition

Editor: David W. Kimberlin, MD, FAAP
Associate editors: Michael T. Brady, MD, FAAP; Mary Anne Jackson, MD, FAAP; and Sarah S. Long, MD, FAAP

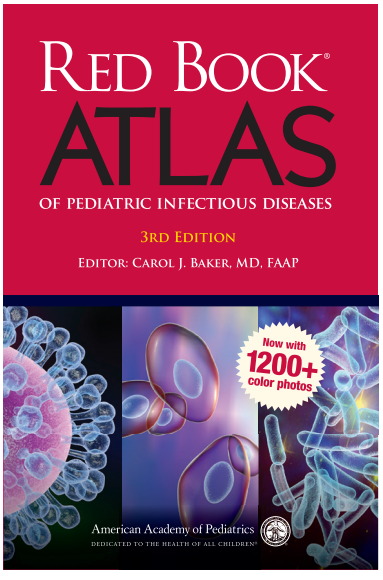
Extending an 8-decade tradition of excellence, *Red Book* provides the most reliable and clinically useful information on the manifestations, etiology, epidemiology, diagnosis, and treatment of more than 200 childhood infectious diseases.

Paperback, May 2018—1,213 pages
MA0858
Book ISBN 978-1-61002-146-3
eBook ISBN 978-1-61002-147-0

Price: $149.95
Member Price: $119.95

Spanish edition available February 2019
MA0915
Book ISBN 978-1-61002-307-8

Price: $149.95
Member Price: $119.95



Red Book® Atlas of Pediatric Infectious Diseases

Editor: Carol J. Baker, MD, FAAP

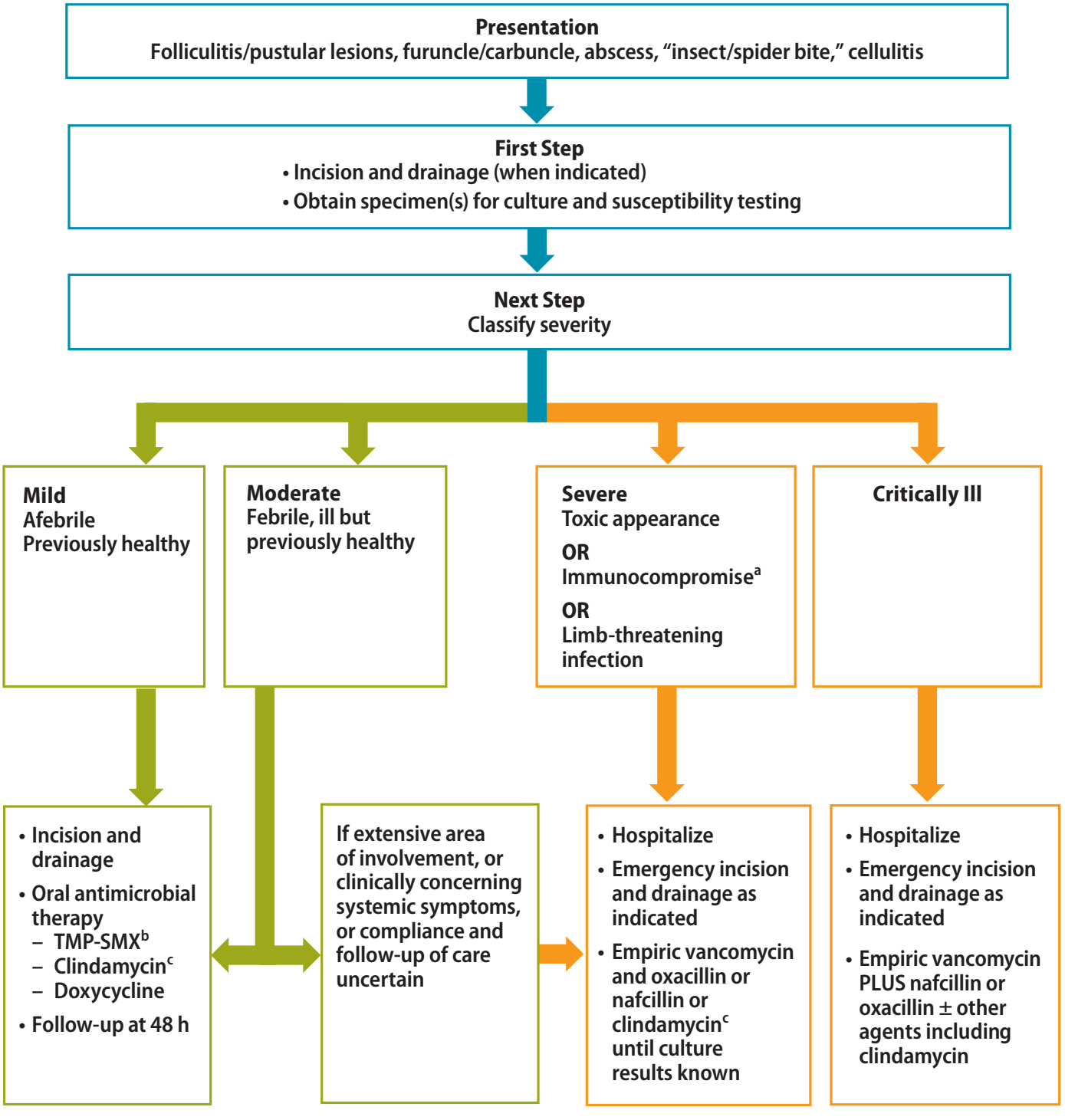
Streamline decision recognition and clinical decision-making with more than 1,200 finely detailed color images adjacent to step-by-step recommendations.

Hardcover, 2016—777 pages
MA0805
Book ISBN 978-1-61002-060-2
eBook ISBN 978-1-61002-061-9

Price: $99.95
Member Price: $79.95

To order these and other AAP infectious disease resources, visit shop.aap.org/books or call toll-free 888/227-1770.

Management of Skin and Soft Tissue Infections Caused by Community-Associated *Staphylococcus aureus*



[a] Immunocompromised, any chronic condition except asthma or eczema.

[b] TMP-SMX = trimethoprim-sulfamethoxazole, if group A *Streptococcus* unlikely.

[c] Consider prevalence of clindamycin-susceptible methicillin-susceptible *S aureus* and "D" test-negative community-associated methicillin-resistant *S aureus* strains in the community.

Techniques for Decolonization of Carriers of *S aureus*

Technique	Details	Effectiveness
Clothing and bed linens	▸ Use items that promote cooling and minimize sweating	▸ Unproven
Combination antimicrobials	▸ 7-day course of oral rifampin and doxycycline plus nasal mupirocin ▸ Give twice daily	▸ Modestly successful in adults
Family decolonization	▸ All family members apply mupirocin to the nares and bathe using chlorhexidine for 5 consecutive days	▸ Associated with decreased recurrences
Skin hygiene	▸ Practice appropriate wound care ▸ Minimize skin trauma ▸ Keep abrasions and cuts covered ▸ Optimize hand hygiene ▸ Shower after activities involving skin-to-skin contact	▸ Unproven
Bleach baths[a]	**For dilute bleach baths:** ▸ Use 1 teaspoon per gallon of water (or 1/4 cup per 1/4 tub or 13 gallons of water) ▸ Bathe for 15 minutes twice weekly for approximately 3 months	▸ Unproven

[a] Liu C, Bayer A, Cosgrove SE, et al. Clinical practic guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children. *Clin Infect Dis*. 2011;52(3):e18-e55

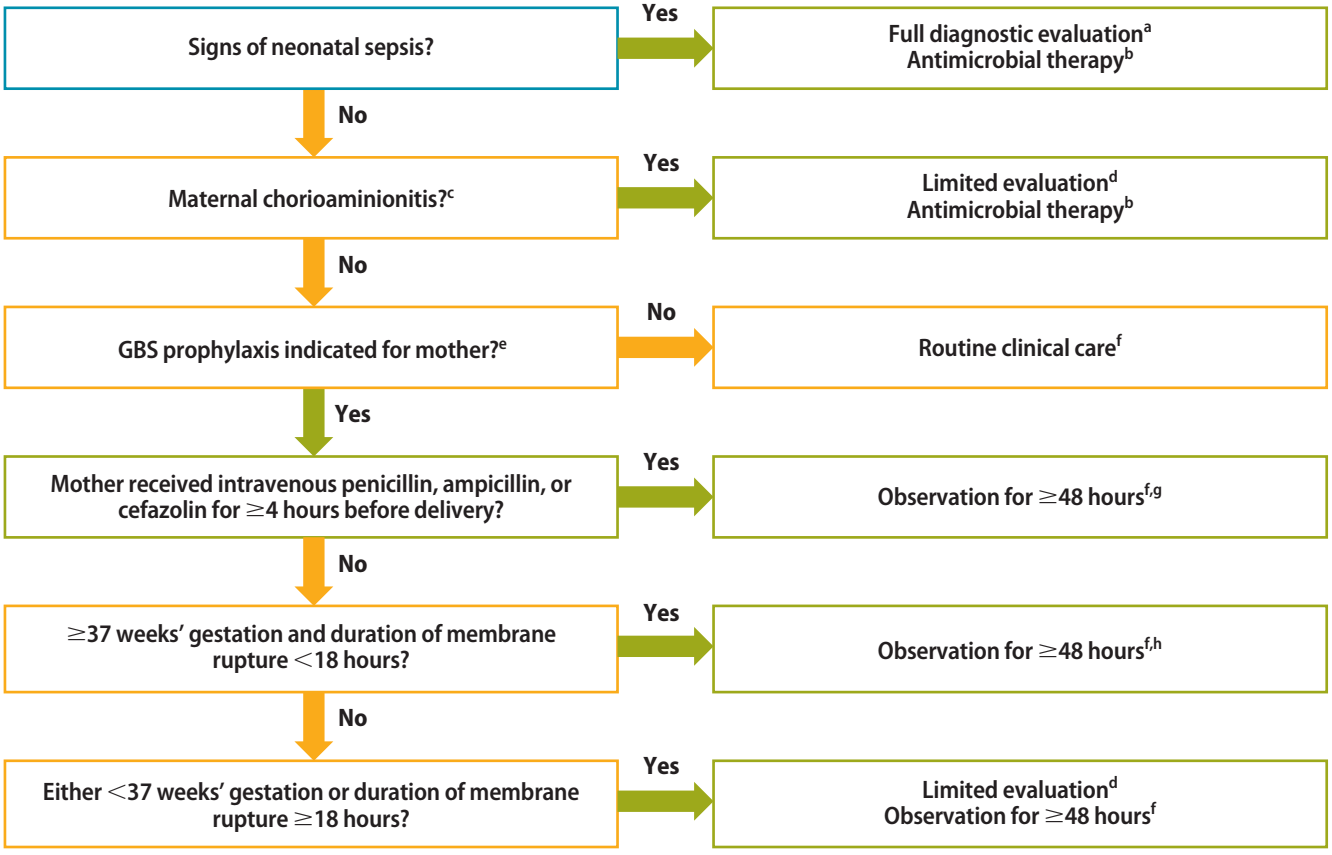
Treatment of GAS Pharyngitis

Drug	Dosage	Indication
Preferred		
Penicillin V (oral)	▸ <27 kg: 400,000 U (250 mg) 2–3 times per day, for 10 days ▸ ≥27 kg: 800,000 U (500 mg), 2–3 times per day, for 10 days	▸ Drug of choice for treatment of GAS pharyngitis
Amoxicillin (oral)	▸ 50 mg/kg (max, 1000–1200 mg), once daily, for 10 days	▸ More palatable suspension than penicillin V
Second-Line Treatments for Specific Situations		
Penicillin G benzathine (IM)	▸ <27 kg: 600,000 U (375 mg) in a single dose ▸ ≥27 kg: 1.2 million U (750 mg) in a single dose	▸ Concerns about adherence to daily therapy
Cephalexin (oral)	▸ 25–50 mg/kg/day, divided into 2 doses ▸ 10-day course	▸ Nonanaphylactic allergy to penicillin
Clindamycin (oral)[b]	▸ 20 mg/kg/day, divided into 3 doses (max, 900 mg/day), for 10 days	▸ Immediate (anaphylactic) or type I hypersensitivity to penicillin
Erythromycin[a,b] (oral) *or* clarithromycin[b] (oral)	▸ Erythromycin: 40–50 mg/kg/day, divided into 3–4 doses, max 4 g per day ▸ Clarithromycin: 15 mg/kg/day, divided into 2 doses, max 1 g per day ▸ 10-day course	▸ Allergy to penicillin
Azithromycin (oral)	▸ 12 mg/kg/day for 1 day, followed by 6 mg/kg/day for an additional 4 days (max, 500 mg/day)	▸ Allergy to penicillin

[a] Erythromycin is associated with substantially higher rates of gastrointestinal tract adverse effects compared with clarithromycin or azithromycin.

[b] Currently, up to 15% of group A streptococci may be resistant to clindamycin and the macrolides.

Management of Neonates for Prevention of Early-Onset Group B Streptococcal (GBS) Disease



[a] Full diagnostic evaluation includes complete blood cell (CBC) count with differential, platelets, blood culture, chest radiograph (if respiratory abnormalities are present), and lumbar puncture (if patient stable enough to tolerate procedure and sepsis is suspected).

[b] Antimicrobial therapy should be directed toward the most common causes of neonatal sepsis, including GBS and other organisms (including gram-negative pathogens), and should take into account local anitmicrobial resistance patterns.

[c] Consultation with obstetric providers is important to determine the level of clinical suspicion for chorioamnionitis (now known as intra-amniotic infection). Intra-amniotic infection is diagnosed clinically, and some of the signs are nonspecic.

[d] Limited evaluation includes blood culture (at birth) and CBC count with differential and platelets (at birth and/or at 6–12 hours of life).

[e] GBS prophylaxis indicated if one or more of the following: (1) mother GBS positive at 35 to 37 weeks' gestation; (2) GBS status unknown with one or more intrapartum risk factors, including <37 weeks' gestation, rupture of membranes ≥18 hours or temperature ≥100.4° F (38.0° C), or intrapartum nucleic acid amplification test results positive for GBS; (3) GBS bacteriuria during current pregnancy; (4) history of a previous infant with GBS disease.

[f] If signs of sepsis develop, a full diagnostic evaluation should be performed and antimicrobial therapy should be initiated.

[g] If ≥37 weeks' gestation, observation may occur at home after 24 hours if other discharge criteria have been met, if there is a knowledgeable observer and ready access to medical care.

[h] Some experts recommend a CBC with differential and platelets at 6–12 hours of age.

Diarrheal Infections: Control Measures and Guidelines for Return to School or Child Care

Causative Agent	Control Measures	Return to School or Child Care
Unknown	▸ Medical evaluation for stools with blood or mucus. ▸ Educating child care providers and food handlers about infection control. ▸ Maintaining cleanliness of surfaces and food preparation areas using appropriate disinfectants (principally sodium hypochlorite [chlorine bleach]). ▸ Hand hygiene for staff and children on arrival; when moving from one group to another; before and after contact with food or medication administration; and after diaper changing or toileting, contact with nasal or other body secretions, animals, garbage, and playing outside. ▸ Excluding caregivers or food handlers who are ill until 48 hours after recovery. ▸ Hand washing for 20 seconds with soap and water should be prioritized in child care settings, and is required whenever there is visible particulate matter. ▸ For children older than 24 months, alcohol-based hand sanitizer may be substituted when soap and water is not available. Adult supervision is required to prevent ingestion or aerosolization of alcohol.	Non–toilet-trained children may return when stools are contained in the diaper. Toilet-trained children may return when: ▸ they no longer have accidents when stooling, and ▸ stool frequency becomes no more than 2 stools above the child's normal frequency, even if the stools remain loose.
Campylobacter **(outbreaks uncommon in child care centers)**	▸ Treatment of case(s) ▸ General measures for interrupting enteric transmission in child care centers (see "Unknown," above). ▸ Azithromycin or erythromycin treatment may further limit the potential for transmission.	See guidance for diarrhea of unknown cause, above.
Clostridium difficile	▸ Treatment of case(s) ▸ Hand hygiene using soap and water; alcohol-based hand sanitizers are not as effective against this pathogen. ▸ Neither test of cure nor repeat testing should be performed for asymptomatic children in whom *C difficile* was diagnosed previously.	See guidance for diarrhea of unknown cause, above.
Cryptosporidium	▸ Treatment of case(s) ▸ Hand hygiene using soap and water; alcohol-based hand sanitizers are not as effective against this pathogen.	See guidance for diarrhea of unknown cause, above.
E coli **(STEC)**	▸ Treatment of case(s) ▸ Immediate involvement of public health authorities is critical; rapid reporting of cases allows interventions to prevent further disease. ▸ Stool cultures should be performed for any symptomatic contacts. ▸ Stool cultures of asymptomatic contacts may aid in controlling spread. ▸ Strict attention to hand hygiene is important but can be insufficient to prevent transmission.	Ill children with STEC O157 infection or virulent non-O157 STEC infection (such as those caused by Stx2-producing strains or in the context of an outbreak that includes HUS cases or a high frequency of bloody diarrhea) should not be permitted to re-enter the child care center until 2 stool cultures (obtained at least 48 hours after any antimicrobial therapy has been discontinued) are negative, AND stools are contained in the diaper or the child is continent, AND stool frequency is no more than 2 stools above that child's normal frequency for the time the child is in the program, AND the health department agrees with the return to child care. (Some state health departments have less stringent exclusion policies for children who have recovered from less virulent STEC infection.) The child care center should be closed to new admissions during an outbreak, and care should be exercised to prevent transfer of exposed children to other centers.
Giardia	▸ Optimized sanitation and personal hygiene should be emphasized. ▸ Hand hygiene with soap and water by staff and children, especially after toilet use or handling of soiled diapers. ▸ When an outbreak is suspected, the local health department should be contacted, and an epidemiologic investigation should be undertaken to identify and treat all symptomatic children, child care providers, and family members infected with *G intestinalis*. ▸ Testing of asymptomatic individuals is not recommended.	See guidance for diarrhea of unknown cause; health department agrees with the return to child care.

Diarrheal Infections: Control Measures and Guidelines for Return to School or Child Care

Causative Agent	Control Measures	Return to School or Child Care
Norovirus	▸ General measures for interruption of enteric transmission in schools and child care centers. ▸ Hand hygiene using soap and water; alcohol-based hand sanitizers are not as effective against this pathogen. ▸ Surfaces should be washed with soap and water. Bleach solutions or other products with confirmed virucidal activity against norovirus can be used and may help prevent disease transmission resulting from contact with environmental surfaces. ▸ If a source of transmission can be identified (eg, contaminated food or water), then specific interventions to interrupt transmission can be effective.	See guidance for diarrhea of unknown cause, above.
Rotavirus	▸ General measures for interrupting enteric transmission in child care centers. ▸ Surfaces should be washed with soap and water. Few commercially available cleaning products have confirmed virucidal activity against rotavirus. Bleach solutions or other products with confirmed virucidal activity against rotavirus can be used to inactivate rotavirus and may help prevent disease transmission resulting from contact with environmental surfaces.	See guidance for diarrhea of unknown cause, above.
Salmonella	▸ General measures for interrupting enteric transmission in school and child care centers. ▸ Antimicrobial therapy is not recommended for people with asymptomatic NTS infection or uncomplicated diarrhea or for people who are contacts of an infected person. ▸ Limit exposure to certain animals, including reptiles, amphibians, and poultry, are not recommended in child care settings.	When NTS serovars are identified in a symptomatic child care attendee or staff member with enterocolitis, older children and staff members do not need to be excluded unless they are symptomatic. Stool cultures are not required for asymptomatic contacts. Children or staff members with NTS enterocolitis do not require negative culture results from stool samples; children can return to child care facilities according to the guidance for diarrhea of unknown cause, above. When *Salmonella* serovar Typhi infection is identified in a child care staff member, local or state health departments may be consulted regarding regulations for length of exclusion and testing, which may vary by jurisdiction. Because infections with *Salmonella* serovars Typhi or Paratyphi are transmitted easily and can be severe, exclusion of an infected child is warranted until results of 3 stool samples obtained at least 48 hours after cessation of antimicrobial therapy have negative culture results for *Salmonella* serovars Typhi or Paratyphi.
Shigella	▸ Treatment of case(s) ▸ General measures for interrupting enteric transmission in child care centers. ▸ Meticulous hand hygiene is the single most important measure to decrease transmission. Waterless hand sanitizers may be effective as an adjunct to washing hands with soap and in circumstances where access to soap or clean water is limited. ▸ Stool specimens from symptomatic attendees and staff members should be cultured. ▸ The local health department should be notified to evaluate and manage potential outbreaks.	Infected people should be excluded until treatment is complete and a test result from at least 1 stool sample is negative (some states may require >1 negative stool sample); following this, children can return to child care facilities according to the guidance for diarrhea of unknown cause, above.

STEC indicates Shiga toxin-producing *E coli;* HUS, hemolytic uremic syndrome; NTS, nontyphoidal *Salmonella*

NOTE: The main goals of exclusion and return to group child care of children with diarrhea are to prevent significant outbreaks and severely harmful disease. Avoid unnecessary exclusion. Reasons to exclude for diarrhea include:

1. excessive number of diapers (time-consuming for child care staff),
2. stool spillage (outside of diapers or accidents among potty-trained children) to prevent general environmental contamination, and
3. prevention of outbreak-causing or harmful pathogens.

In most cases, child care providers and pediatric health care providers will not know the cause of a child's diarrhea. Testing, public health involvement, and required health care visits should be prompted by:

1. children with diarrhea who have blood or mucus in the stool, or
2. symptomatic children involved in an outbreak.

Guide to Contraindications and Precautions to Immunizations, 2018

Vaccine	Contraindications	Precautions[a]	Conditions in Which Vaccines Should Be Given if Indicated
General for all routinely administered vaccines (eg, DTaP, DT, Td, Tdap, IPV, MMR, MMRV, Hib, pneumococcal, meningococcal, hepatitis B, varicella, hepatitis A, influenza, zoster, rotavirus, HPV)	▸ Severe allergic reaction (eg, anaphylaxis) to a vaccine contraindicates further doses of that vaccine ▸ Severe allergic reaction (eg, anaphylaxis) to a vaccine constituent contraindicates the use of vaccines containing that substance	▸ Current moderate or severe illnesses with or without fever ▸ Latex allergy[b]	▸ Mild to moderate local reaction (soreness, redness, swelling) after a dose of an injectable antigen ▸ Low-grade or moderate fever after a previous vaccine dose ▸ Current mild acute illness with or without low-grade fever ▸ Current antimicrobial therapy ▸ Convalescent phase of illness(es) ▸ Preterm birth (same dosage and indications as for healthy, full-term infants); hepatitis B is the exception[c] ▸ Recent exposure to an infectious disease ▸ History of penicillin or other non-specific allergies or fact that relatives have such allergies ▸ Pregnancy of mother or other household contact ▸ Unimmunized household contact ▸ Immunodeficient household contact ▸ Breastfeeding (nursing infant OR lactating mother) ▸ Lack of a physical examination
DTaP	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component ▸ Encephalopathy (eg, coma, decreased level of consciousness, or prolonged seizures) not attributable to another identifiable cause, within 7 days of administration of previous dose of DTaP/DTwP	▸ Current moderate or severe illnesses with or without fever ▸ Progressive neurologic disorder, including infantile spasms, uncontrolled epilepsy, and progressive encephalopathy, generally have DTaP immunization deferred temporarily until neurologic status clarified and stabilized. ▸ Guillain-Barré syndrome (GBS) within 6 wk after a dose[e] ▸ History of Arthus-type hypersensitivity reaction after a previous dose of a tetanus- or diphtheria toxoid–containing vaccine (defer for 10 years after last tetanus toxoid–containing vaccine)	▸ Family history of seizures[d] ▸ Family history of sudden infant death syndrome ▸ Family history of an adverse event after DTaP/DTwP administration ▸ Fever <105°F (<40°C), fussiness, or mild drowsiness after a previous dose of DTwP/DTaP ▸ Stable neurologic conditions (eg, cerebral palsy, well-controlled seizures, or developmental delay)
DT, Td	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever ▸ GBS within 6 wk after previous dose of tetanus toxoid–containing vaccine ▸ History of Arthus-type hypersensitivity reaction after a previous dose of tetanus or diphtheria toxoid–containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus toxoid–containing vaccine (see DTaP)	
Hepatitis A	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever	
Hepatitis B	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component ▸ Hypersensitivity to yeast	▸ Current moderate or severe acute illness with or without fever ▸ Preterm birth[c]	▸ Pregnancy ▸ Autoimmune disease (eg, systemic lupus erythematosis or rheumatoid arthritis).

Guide to Contraindications and Precautions to Immunizations, 2018 (*cont*)

Vaccine	Contraindications	Precautions[a]	Conditions in Which Vaccines Should Be Given if Indicated
Hib	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever	
HPV	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever ▸ Pregnancy	▸ Administration to people with minor acute illnesses ▸ Immunosuppression ▸ Equivocal or abnormal Papanicolaou test ▸ HPV infection, anogenital warts, or HPV-associated lesions ▸ Breastfeeding
Influenza (inactivated)[f]	▸ Severe allergic reaction (eg, anaphylaxis) to a previous dose or vaccine component	▸ Current moderate or severe acute illness with or without fever ▸ GBS within 6 wk after a previous influenza immunization	▸ Pregnancy ▸ Nonsevere allergy to thimerosal ▸ Current administration of warfarin or theophylline ▸ All children with egg allergy can receive influenza vaccine with no additional precautions to those for routine vaccinations
Influenza (live attenuated)[g]	▸ Severe allergic reaction (eg, anaphylaxis) to a previous dose or vaccine component ▸ Pregnancy ▸ Receipt of specific antivirals (ie, zanamivir, oseltamivir, peramivir) within 48 hours before vaccination. Avoid use of these antiviral drugs for 5–7 days after vaccination ▸ Children 2 through 4 y of age whose parents or caregivers report that a health care provider has told them during the preceding 12 mo that their child had wheezing or asthma or whose medical record indicates a wheezing episode has occurred during the preceding 12 mo ▸ Diagnosis of asthma ▸ Receiving aspirin or other salicylates	▸ Current moderate or severe acute illness with or without fever ▸ GBS within 6 wk after a previous influenza immunization ▸ Conditions the ACIP lists as precautions but which are not contraindications in the vaccine package insert: immune suppression, certain chronic medical conditions such as asthma, diabetes, heart or kidney disease	▸ Health care providers that see patients with chronic diseases or altered immunocompetence (an exception is providers for severely immunocompromised patients requiring care in a protected environment, such as a bone marrow transplant unit) ▸ Contacts of people with chronic disease or altered immunocompetence (an exception is contacts of severely immunocompromised patients requiring care in a protected environment) ▸ Breastfeeding ▸ All children with egg allergy can receive influenza vaccine with no additional precautions to those for routine vaccinations
IPV	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever	▸ Previous receipt of one or more doses of oral poliovirus vaccine
Meningococcal conjugate (MenACWY)	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component or to diphtheria toxoid	▸ Current moderate or severe acute illness with or without fever	
Meningococcal B (MenB)	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever	

Guide to Contraindications and Precautions to Immunizations, 2018 (*cont*)

Vaccine	Contraindications	Precautions[a]	Conditions in Which Vaccines Should Be Given if Indicated
MMR[f,g]	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component ▸ Pregnancy ▸ Known severe immunodeficiency (eg, from hematologic and solid tumors, receipt of chemotherapy, long-term immunosuppressive therapy,[h] receipt of biologic response modifiers, congenital immunodeficiency, or patients with HIV infection who are severely immunocompromised[i])	▸ Current moderate or severe acute illness with or without fever ▸ Recent (within 11 mo, depending on product and dose) Immune Globulin administration ▸ Thrombocytopenia or history of thrombocytopenic purpura, in isolation or after prior MMR vaccination ▸ Tuberculosis or positive PPD or interferon gamma release assay (IGRA)[j] ▸ Personal or family history of seizure if provided as MMRV (consider giving as separate administrations [MMR+V])	▸ Simultaneous tuberculin skin testing or IGRA[k] ▸ Breastfeeding ▸ Pregnancy of mother of recipient ▸ Immunodeficient family member or household contact ▸ Nonanaphylactic reactions to gelatin or neomycin ▸ Allergy to egg ▸ Recipient is female and of childbearing age
PCV13 and PPSV23	▸ For PCV13, severe allergic reaction (eg, anaphylaxis) after a previous dose of PCV7 or PCV13 or to a vaccine component, or to diphtheria toxoid ▸ For PPSV23, severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component	▸ Current moderate or severe acute illness with or without fever	▸ History of invasive pneumococcal disease or pneumonia
Rotavirus	▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component ▸ Severe combined immune deficiency (SCID) ▸ History of previous episode of intussusception ▸ Infants exposed in utero to biologic response modifiers such as anti-TNF agents	▸ Current moderate or severe acute illness, with or without fever ▸ Altered immunocompetence other than SCID ▸ Chronic gastrointestinal disease ▸ Spina bifida or bladder exstrophy	▸ Breastfeeding ▸ Immunodeficient family member or household contact ▸ Preterm infants ▸ Pregnant household contacts
Tdap	▸ Severe allergic reaction (eg, anaphylaxis) to a previous dose or vaccine component ▸ History of encephalopathy (eg, coma, prolonged seizures) within 7 days of administration of a pertussis vaccine that is not attributable to another identifiable cause	▸ Current moderate or severe acute illness, with or without fever ▸ GBS 6 wk or less after previous dose of a tetanus toxoid vaccine ▸ Progressive neurologic disorder, uncontrolled epilepsy, or progressive encephalopathy until the condition has stabilized ▸ History of Arthus-type hypersensitivity reaction (see DTaP)	▸ Temperature 105°F (40.5°C) or greater within 48 h after DTwP/DTaP immunization not attributable to another cause ▸ Collapse or shock-like state (hypotonic hyporesponsive episode) within 48 h after DTwP/DTaP immunization ▸ Persistent crying lasting 3 h or longer, occurring within 48 h after DTwP/DTaP immunization ▸ Convulsions with or without fever, occurring within 3 days after DTwP/DTaP immunization ▸ History of extensive limb swelling reaction after pediatric DTwP/DTaP or Td immunization that was not an Arthus-type hypersensitivity reaction ▸ Stable neurologic disorder, including well-controlled seizures, history of seizure disorder, and cerebral palsy ▸ Brachial neuritis ▸ Pregnancy ▸ Breastfeeding ▸ Immunosuppression, including people with HIV (Tdap poses no known safety concern for immunosuppressed people; the immunogenicity of Tdap in people with immunosuppression has not been studied and could be suboptimal) ▸ Intercurrent minor illness ▸ Antimicrobial use

Guide to Contraindications and Precautions to Immunizations, 2018 (*cont*)

Vaccine	Contraindications	Precautions[a]	Conditions in Which Vaccines Should Be Given if Indicated
Varicella[g]	▸ Pregnancy ▸ Severe allergic reaction (eg, anaphylaxis) after a previous dose or to a vaccine component ▸ Known severe immunodeficiency (hematologic and solid tumors, receipt of chemotherapy, long-term immunosuppressive therapy,[h] receipt of biologic response modifiers, congenital immunodeficiency, or patients with HIV infection who are severely immunocompromised[i])	▸ Current moderate or severe acute illness with or without fever ▸ Recent receipt of Immune Globulin ▸ Family history of immunodeficiency[l] ▸ Personal or family history of seizure if provided as MMRV (consider giving as separate administrations [MMR+V]) ▸ Receipt of specific antivirals (ie, acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 21 days after vaccination	▸ Pregnancy of mother of recipient ▸ Immunodeficiency in a household contact ▸ HIV-infected children without evidence of varicella immunity and with a CD4+ T-lymphocyte percentage of ≥15% ▸ Household contact with HIV

DTaP indicates diphtheria and tetanus toxoids and acellular pertussis; DT, pediatric diphtheria-tetanus toxoid; Td, adult tetanus-diphtheria toxoid; Tdap, tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; IPV, inactivated poliovirus; MMR, measles-mumps-rubella; MMRV, measles-mumps-rubella-varicella; Hib, *Haemophilus influenzae* type b; HPV, human papillomavirus; DTP, diphtheria and tetanus toxoids and pertussis; GBS, Guillain-Barré syndrome; HIV, human immunodeficiency virus; PPD, purified protein derivative (tuberculin); PCV7 and PCV13, pneumococcal conjugate vaccine; PPSV23, pneumococcal polysaccharide vaccine.

[a] The events or conditions listed as precautions, although not contraindications, should be reviewed carefully. The benefits and risks of administering a specific vaccine to a person under the circumstances should be considered. If the risks are believed to outweigh the benefits, the immunization should be withheld; if the benefits are believed to outweigh the risks (eg, during an outbreak or foreign travel), the immunization should be administered. Whether and when to administer DTaP to children with proven or suspected underlying neurologic disorders should be decided on an individual basis.

[b] If a person reports a severe (anaphylactic) allergy to latex, vaccines supplied in vials or syringes that contain natural rubber should not be administered unless the benefits of immunization outweigh the risks of an allergic reaction to the vaccine. For latex allergies other than anaphylactic allergies (eg, a history of contact allergy to latex gloves), vaccines supplied in vials or syringes that contain dry natural rubber or latex can be administered.

[c] Infants weighing less than 2 kg at birth and born to hepatitis B surface antigen (HBsAg)–negative mothers should receive the first dose of HepB vaccine series starting at 1 month of chronologic age or at hospital discharge if before 1 month of chronologic age. All infants weighing less than 2 kg born to HBsAg-positive mothers should receive immunoprophylaxis (Hepatitis B Immune Globulin and vaccine) beginning as soon as possible after birth, and always within 12 hours after birth, followed by appropriate postimmunization testing and receipt of 3 doses of hepatitis B vaccine. All infants weighing less than 2 kg at birth and born to mothers with unknown HBsAg status should receive hepatitis B vaccine within 12 hours of birth; if status remains unknown by 12 hours after birth or if maternal HBsAg is positive, Hepatitis B Immune Globulin should be given.

[d] Acetaminophen given before administering DTaP and thereafter every 4 hours for 24 hours may be considered for children with a personal or family (ie, siblings or parents) history of seizures.

[e] The decision to give additional doses of DTaP should be made on the basis of consideration of the benefit of further immunization versus the risk of recurrence of GBS. For example, completion of the primary series in children is justified.

[f] Egg allergy is not considered a contraindication or precaution.

[g] The administration of multiple live-virus vaccines within 28 days (4 weeks) of one another if not given on the same day may result in suboptimal immune response. Data substantiate this risk for MMR and possibly varicella vaccine, which should, therefore, be given on the same day or more than 4 weeks apart.

[h] Immunosuppressive steroid dose is considered to be 2 or more weeks of daily receipt of 20 mg prednisone or the equivalent. Vaccination should be deferred for at least 1 month after discontinuation of such therapy.

[i] Evidence of severe immunosuppression in HIV-infected children is CD4+ T-lymphocyte percentage less than 15% in children of any age, and CD4+ T-lymphocyte percentage less than 200 lymphocytes/mm^3 in children 6 years and older. Severely immunocompromised HIV-infected infants, children, adolescents, and young adults should not receive measles virus-containing vaccine, because vaccine-related pneumonia has been reported. The quadrivalent measles-mumps-rubella-varicella (MMRV) vaccine should not be administered to any HIV-infected infant, regardless of degree of immunosuppression, because of lack of safety data in this population.

[j] A theoretical basis exists for concern that measles vaccine might exacerbate tuberculosis. Consequently, before administering MMR to people with untreated active tuberculosis, initiating antituberculosis therapy is advisable.

[k] Measles immunization may suppress tuberculin reactivity temporarily. MMR vaccine may be given after, or on the same day as, tuberculin skin testing. If MMR has been given recently, postpone the tuberculin skin test until 4 to 6 weeks after administration of MMR. The effect of MMR on IGRA test results is unknown.

[l] Varicella vaccine should not be administered to a person who has a family history of congenital or hereditary immunodeficiency (such as parents or siblings) until the potential vaccinee's immune competence has been substantiated clinically or verified by a laboratory.

Recommendations for Preoperative Antimicrobial Prophylaxis

Operation	Likely Pathogens	Recommended Drugs	Preoperative Dose
Neonatal (≤72 h of age)—all major procedures	Group B streptococci, enteric gram-negative bacilli,[a] enterococci, coagulase-negative staphylococci	Ampicillin **PLUS** Gentamicin	50 mg/kg 4 mg/kg
Neonatal (>72 h of age)—all major procedures	Prophylaxis targeted to colonizing organisms, nosocomial organisms, and operative site		
Cardiac (cardiac surgical procedures, prosthetic valve or pacemaker, ventricular assist devices)	*Staphylococcus epidermidis*, *Staphylococcus aureus*, *Corynebacterium* species, enteric gram-negative bacilli[a]	Cefazolin **OR** (if MRSA or MRSE is likely) Vancomycin	30 mg/kg (max 2 g) 15 mg/kg
Gastrointestinal			
Esophageal and gastroduodenal	Enteric gram-negative bacilli,[a] gram-positive cocci	Cefazolin (high risk only[b])	30 mg/kg (max 2 g)
Biliary tract	Enteric gram-negative bacilli,[a] enterococci	Cefazolin[c]	30 mg/kg (max 2 g)
Colorectal or appendectomy (uncomplicated, nonperforated)	Enteric gram-negative bacilli,[a] enterococci, anaerobes (*Bacteroides* species)[d]	Cefoxitin	40 mg/kg (max 3 g)
		OR	
		Metronidazole **PLUS** Gentamicin	15 mg/kg (max 1 g) 2.5 mg/kg
		OR	
		Cefazolin **PLUS** Metronidazole	30 mg/kg (max 2 g) 15 mg/kg (max 1 g)
		OR	
		Clindamycin **PLUS** Gentamicin **OR** Ciprofloxacin	10 mg/kg (max 600 mg) 2.5 mg/kg (gentamicin) 10 mg/kg (ciprofloxacin)
Ruptured viscus (regarded as treatment, not prophylaxis)	Enteric gram-negative bacilli,[a] enterococci, anaerobes (*Bacteroides* species)[d]	Cefoxitin **WITH OR WITHOUT** Gentamicin	40 mg/kg (max 3 g) 2.5 mg/kg
		OR	
		Gentamicin **PLUS** Metronidazole **PLUS** Ampicillin	2.5 mg/kg 15 mg/kg (max 1 g) 50 mg/kg (max 2 g)
		OR	
		Meropenem	20 mg/kg (max 1 g)
		OR	
		Other regimens for complicated appendicitis[e]	

Recommendations for Preoperative Antimicrobial Prophylaxis (*cont*)

Operation	Likely Pathogens	Recommended Drugs	Preoperative Dose
Genitourinary	Enteric gram-negative bacilli,[a] enterococci	Cefazolin	30 mg/kg (max 2 g)
		OR	
		Ampicillin **PLUS** Gentamicin	50 mg/kg (max 2 g) 2.5 mg/kg
Head and neck surgery (incision through oral or pharyngeal mucosa)	Anaerobes, enteric gram-negative bacilli,[a] *S aureus*	Clindamycin **WITH OR WITHOUT** Gentamicin	10 mg/kg (max 600 mg) 2.5 mg/kg
		OR	
		Cefazolin **PLUS** Metronidazole	30 mg/kg (max 2 g) 15 mg/kg (max 1 g)
Neurosurgery (craniotomy, intrathecal baclofen shunt or ventricular shunt placement)	*S epidermidis*, *S aureus*	Cefazolin **OR** (if MRSA or MRSE is likely) Vancomycin	30 mg/kg (max 2 g) 15 mg/kg
Ophthalmic	*S epidermidis*, *S aureus*, streptococci, enteric gram-negative bacilli,[a] *Pseudomonas* species	Gentamicin, ciprofloxacin, ofloxacin, moxifloxacin, tobramycin **OR** Neomycin-gramicidin-polymyxin B **OR** Cefazolin	Multiple drops topically for 2–24 h before procedure Multiple drops topically for 2–24 h before procedure 100 mg, subconjunctivally
Orthopedic (internal fixation of fractures, implantation of materials including prosthetic joint and spinal procedures with and without instrumentation)	*S epidermidis*, *S aureus*	Cefazolin **OR** (if MRSA or MRSE is likely) Vancomycin	30 mg/kg (max 2 g) 15 mg/kg
Thoracic (noncardiac)	*S epidermidis*, *S aureus*, streptococci, gram-negative enteric bacilli[a]	Cefazolin **OR** (if MRSA is likely) Vancomycin	30 mg/kg (max 2 g) 15 mg/kg
Traumatic wound (exceptionally varied pathogens, based on the anatomic site injured, and the instrument causing the trauma, particularly forpenetrating injuries such as motor vehicle accidents or farm injuries)	Skin: *S aureus*, group A streptococci, *S epidermidis*	Cefazolin	30 mg/kg (max 2 g)
	Perforated viscus: gram-negative enteric bacilli, *Clostridium* species	Cefoxitin **WITH OR WITHOUT** Gentamicin	40 mg/kg (max 3 g) 2.5 mg/kg
		OR	
		Gentamicin **PLUS** Metronidazole **PLUS** Ampicillin	2.5 mg/kg 10 mg/kg (max 1 g) 50 mg/kg (max 2 g)
		OR	
		Meropenem	20 mg/kg (max 1 g)
		OR	
		Other regimens for complicated appendicitis[e]	

MRSA indicates methicillin-resistant *Staphylococcus aureus;* MRSE, methicillin-resistant *Staphylococcus epidermidis.*

[a] Selection of antibiotics should take into consideration the susceptibility patterns of isolates found in the patient and at the institution.

[b] Esophageal obstruction, decreased gastric acidity, or gastrointestinal motility.

[c] Acute cholecystitis, nonfunctioning gallbladder, obstructive jaundice, common duct stones.

[d] High rates of resistance to clindamycin (up to 30%) now reported for *Bacteroides fragilis*. Lowest rates of resistance to carbapenems, ampicillin/sulbactam, and piperacillin/tazobactam. Resistance to cefoxitin reported at 3.5%–9.4% (Snydman DR, Jacobus NV, McDermott LA, et al. Update on resistance of *Bacteroides fragilis* group and related species with special attention to carbapenems 2006–2009. *Anaerobe.* 2011;17[4]:147-151).

[e] Solomkin JS, Mazuski JE, Bradley JS, et al. Diagnosis and management of complicated intra-abdominal infection in adults and children: guidelines by the Surgical Infection Society and the Infectious Diseases Society of America (erratum in *Clin Infect Dis.* 2010;50(12):1695; dosage error in article text). *Clin Infect Dis.* 2010;50(2):133–164.

Suggested Intervals Between Immune Globulin Administration and Active Immunization With MMR, MMRV, or Monovalent Varicella Vaccines

Indications or Product	Route	Dose		Interval, mo[a]
		U or mL	mg IgG/kg	
Blood transfusion				
Washed RBCs	IV	10 mL/kg	Negligible	0
RBCs, adenine-saline added	IV	10 mL/kg	10	3
Packed RBCs	IV	10 mL/kg	20–60	6
Whole blood	IV	10 mL/kg	80–100	6
Plasma or platelet products	IV	10 mL/kg	160	7
Botulinum Immune Globulin Intravenous (Human [as BabyBIG])	IV	1 mL/kg	50	6
Cytomegalovirus IGIV (hyperimmune globulin)	IV	…	150 (maximum)	6
Hepatitis A prophylaxis (as IG)				
Contact prophylaxis	IM	0.1 mL/kg	…	3
International travel	IM	0.1 or 0.2 mL/kg	…	3
Hepatitis B prophylaxis (as HBIG)	IM	0.06 mL/kg	10	3
Measles prophylaxis (as IG) for people not pregnant or severely immunocompromised[b]	IM	0.5 mL/kg	80	6
Measles prophylaxis for pregnant women and severely immunocompromised host[b] (as IGIV)	IV	…	400	8
Rabies prophylaxis (as RIG)	IM	20 IU/kg	22	4
Replacement (or therapy) of immune deficiencies (as IGIV)	IV	…	300–400	8
RSV prophylaxis (palivizumab monoclonal antibody)[c]	IM	…	15 (monoclonal)	None
Tetanus prophylaxis (as TIG)	IM	250 U	10	3
Therapy for ITP (as IGIV)	IV	…	400	8
Therapy for ITP (as IGIV)	IV	…	800–1000	10
Therapy for ITP or Kawasaki disease (as IGIV)	IV	…	1600–2000	11
Varicella prophylaxis (as IGIV)	IV	…	400	8
Varicella prophylaxis (as VariZIG)	IM	125 U/10 kg (maximum 625 U)	20–40	5

MMR indicates measles-mumps-rubella; MMRV, measles-mumps-rubella-varicella; RSV, respiratory syncytial virus; IM, intramuscular; TIG, Tetanus Immune Globulin; IG, Immune Globulin; HBIG, Hepatitis B Immune Globulin; RIG, Rabies Immune Globulin; VariZIG, Varicella-Zoster Immune Globulin; IV, intravenous; RBCs, Red Blood Cells; IGIV, Immune Globulin Intravenous; ITP, immune (formerly termed "idiopathic") thrombocytopenic purpura.

[a] These intervals should provide sufficient time for decreases in passive antibodies in all children to allow for an adequate response to measles vaccine. Physicians should not assume that children are protected fully against measles during these intervals. Additional doses of IG or measles vaccine may be indicated if exposure to measles is likely or has occurred.

[b] IGIV is the recommended IG preparation for pregnant women without evidence of measles immunity and for severely immunocompromised hosts regardless of immunologic or vaccination status, including patients with severe primary immunodeficiency; patients who have received a bone marrow transplant until at least 12 months after finishing all immunosuppressive treatment, or longer in patients who have developed graft-versus-host disease; patients on treatment for ALL within and until at least 6 months after completion of immunosuppressive chemotherapy; individuals who have received a solid organ transplant; and people with human immunodeficiency virus (HIV) infection or acquired immunodeficiency syndrome (AIDS) who have severe immunosuppression defined as CD4+ T-lymphocyte percentage <15% (all ages) or CD4+ T-lymphocyte count <200 lymphocytes/mm^3 (older than 5 years) and those who have not received MMR vaccine since receiving effective ART.

[c] RSV monoclonal antibody (palivizumab) does not interfere with the immune response to vaccines.

Using Immune Globulin for Prophylaxis and Treatment of Specific Conditions and Infections

Condition (Age of Patient)	Indication	Immune Globulin Recommendations
Antibody deficiency disorders	Replacement therapy	IGIM not routinely recommended. If used, 100 mg/kg (equivalent to 0.66 mL/kg) every 3 wk. (Customary practice: administer twice this dose initially and adjust the interval between doses [2–4 wks] on the basis of trough IgG concentrations and clinical response).
Botulism (infant)	Treatment	Human Botulism Immune Globulin for intravenous use (BIG-IV; BabyBIG) licensed by the FDA for treatment of infant botulism caused by *Clostridium botulinum* type A or type B.
Cytomegalovirus	Treatment of CMV pneumonia in hematopoietic stem cell transplant recipients	The combination of IGIV or CMV-IGIV and ganciclovir, administered intravenously, has been reported to be synergistic in treatment of CMV pneumonia.
	Prophylaxis	▸ Use of CMV-IGIV in pregnant women to prevent CMV transmission is not recommended. ▸ CMV-IGIV is moderately effective in kidney and liver transplant recipients for prophylaxis of CMV disease, and has been used in combination with antiviral agents.
Enterobacteriaceae, serious infections (newborn)	Treatment	IGIV not effective and not recommended.
Enterovirus	Treatment	IGIV administered intravenously or intraventricularly may be beneficial for chronic enterovirus meningoencephalitis in immunodeficient patients. Also has been used for life-threatening neonatal enterovirus infections, severe enterovirus infections in transplant recipients and people with malignancies, suspected viral myocarditis, and enterovirus 71 neurologic disease.
	Prophylaxis, chronic infection	Maintenance administration of IGIV in patients with severe deficits of B-lymphocyte function (eg, severe combined immunodeficiency syndrome, X-linked agammaglobulinemia) may prevent chronic enterovirus infection of the central nervous system.
Hepatitis A (infant [<12 mo])	Prophylaxis for travel	▸ IGIM 0.1 mL/kg[a] protects for up to 1 mo. ▸ For trips of 2 mo or longer, IGIM 0.2 mL/kg[a] should be administered at departure and every 2 mo if exposure to HAV continues.
	Postexposure prophylaxis	▸ Exposure within 2 wk or less, IGIM 0.1 mL/kg.[a] ▸ Exposure >2 wk, no prophylaxis.
Hepatitis A (12 mo through 40 y)	Disease prevention	All people 12 mo of age or older at high risk of HAV disease who have a contraindication to HepA vaccine should receive IGIM.
	Postexposure prophylaxis	▸ Exposure within 2 wk or less, HepA vaccine.[b] ▸ Exposure more than 2 wk, no prophylaxis, but HepA vaccine may be indicated for ongoing exposure.[b] ▸ People of any age who are immunocompromised, have chronic liver disease, or contraindication to vaccination, IGIM 0.1 mL/kg.[a]
Heptatitis B (newborn)	Postexposure prophylaxis	▸ For infants born to women who are positive for both HBsAg and HBeAg, postexposure immunoprophylaxis either with HepB vaccine and HBIG or with HepB vaccine alone effectively prevents most infections after exposure to HBV. Use of both HepB vaccine and HBIG is recommended for greater protection than HepB vaccine alone.
Hepatitis B, (older than 7 days)	Postexposure prophylaxis	▸ HBIG provides short-term protection (3–6 months) and is indicated only for those who have not received HepB vaccine and who have: - Percutaneous or mucosal exposure to HBsAg-positive blood or body fluids. - Been a victim of sexual assault when perpetrator is known to be HBSAg positive. - Sexual contact or needle sharing with an HBsAg-positive person. ▸ Standard Immune Globulin is not effective for postexposure prophylaxis against HBV infection because concentrations of anti-HBs are too low. ▸ If a susceptible child bites someone with chronic HBV infection, HBIG is not recommended.
Hepatitis C	Postexposure prophylaxis	Not recommended.
Kawasaki disease	Primary treatment	▸ Administer a single dose of IGIV, 2 g/kg, over 10–12 hours. IGIV plus aspirin is the treatment of choice and should be initiated as soon as possible in all patients when criteria of classic or incomplete Kawasaki disease are met and alternative diagnoses are unlikely, whether or not coronary artery abnormalities are detected. ▸ Measles- and varicella-containing vaccines should be deferred until 11 mo after receipt of IGIV, 2 g/kg, for treatment of Kawasaki disease.

Using Immune Globulin for Prophylaxis and Treatment of Specific Conditions and Infections (*cont*)

Condition (Age of Patient)	Indication	Immune Globulin Recommendations
Measles	Prophylaxis	▸ Provide IGIM (0.50 mL/kg; max 15 mL) or IGIV (400 mg/kg) within 6 days of exposure to prevent or modify measles in any person who does not have evidence of measles immunity. ▸ IGIV is recommended for pregnant women without evidence of measles immunity and for severely immunocompromised hosts, regardless of immunologic or vaccination status, including cases of - severe primary immunodeficiency; - bone marrow transplant (until ≥12 mos after finishing all immunosuppressive treatment, or longer in patients who have developed graft-versus-host disease); - treatment for acute lymphoblastic leukemia, within and until ≥6 months after completion of immunosuppressive chemotherapy; - solid organ transplant; or - patients <12 months whose mothers received biologic response modifiers during pregnancy. ▸ IG is not indicated for household or other close contacts who have received 1 dose of vaccine at ≥12 mos unless they are severely immunocompromised.
Mumps	Postexposure prophylaxis	IG is not effective.
Parvovirus B19	Treatment of immunodeficient patients	IGIV therapy often is effective and should be considered.
Pneumococcal infections	Prophylaxis	IGIV is recommended for preventing pneumococcal infection in patients with certain congenital or acquired immunodeficiency diseases, including children with HIV infection who have recurrent pneumococcal infections.
Staphylococcus aureus toxin-mediated disease	Treatment	Consider IGIV in patients with severe staphylococcal TSS unresponsive to other therapeutic measures. Optimal regimen is unknown, but 150–400 mg/kg per day for 5 days or a single dose of 1–2 g/kg has been used.
Streptococcal toxic shock syndrome, without necrotizing fasciitis	Treatment	IGIV often is used as adjunctive therapy (with a cell wall inhibitor and a protease inhibitor), typically at 1 g/kg on day 1, followed by 0.5 g/kg on 1–2 subsequent days.
Tetanus	Prophylaxis	▸ Patients with tetanus-prone wounds who have not completed a primary series of tetanus vaccine should receive passive immunization with TIG (in addition to active immunization with tetanus toxoid vaccine, as clinically appropriate). ▸ For infants younger than 6 mo, maternal tetanus toxoid immunization history at time of delivery should be considered in determining need for TIG. ▸ When TIG is required for wound prophylaxis, it is administered intramuscularly in a dose of 250 U (regardless of age or weight).
	Treatment	Single dose of intramuscular human TIG is recommended. Optimal therapeutic dose has not been established. Some experts recommend 500 IU, which appears to be as effective as 3000–6000 IU and causes less discomfort. Infiltration of part of the dose locally around the wound is recommended, although the efficacy of this approach has not been proven. If TIG is not available, IGIV can be used at 200–400 mg/kg.
Rabies	Postexposure prophylaxis	▸ Human RIG (20 IU/kg) should be used concomitantly with the first dose of vaccine for postexposure prophylaxis to bridge the time between possible infection and antibody production. As much of the dose as possible should be used to infiltrate the wound(s), if present, and the remainder given intramuscularly. ▸ If vaccine is not available immediately, RIG should be administered alone, and vaccination should be started as soon as possible. ▸ If RIG is not available immediately, vaccine should be administered and RIG should be administered subsequently if obtained within 7 days after initiating vaccination. ▸ If administration of both vaccine and RIG is delayed, both should be used regardless of the interval between exposure and treatment, within reason. ▸ Vaccine never should be administered in the same parts of the body or with the same syringe used to give RIG.

Using Immune Globulin for Prophylaxis and Treatment of Specific Conditions and Infections (*cont*)

Condition (Age of Patient)	Indication	Immune Globulin Recommendations
Respiratory syncytial virus	Prophylaxis	▸ Palivizumab may be considered to reduce the risk of RSV lower respiratory tract disease in certain children at increased risk of severe disease.[c] ▸ Dose is 15 mg/kg IM, once every 30 days. ▸ First dose should be administered at the onset of the RSV season (maximum of 5 doses). For qualifying infants born during the RSV season, fewer than 5 doses will be needed to provide protection until the RSV season ends in their region. ▸ Not effective for treatment of RSV disease.
Rubella	Prophylaxis	▸ IG does not prevent rubella infection after exposure and is not recommended for that purpose.
Varicella	Prophylaxis	▸ For immunocompetent exposed children ≥12 months of age, varicella vaccine should be administered ideally within 3 days but up to 5 days after exposure (followed by a second dose of vaccine at the age-appropriate interval after the first dose) ▸ When indicated and available, VariZIG is given intramuscularly, 125 U/10 kg body weight (62.5 U if ≤2 kg), maximum 625 U (5 vials) (or a single dose of IGIV at 400 mg/kg if VariZIG unavailable) ▸ If the child cannot be immunized and VariZIG is not indicated or is unavailable, preemptive oral acyclovir or valacyclovir can be given starting day 7 after exposure.
West Nile virus	Treatment	A review of potential treatments (including IGIV with or without a high titer of WNV antibody, WNV recombinant humanized monoclonal antibody, interferon, corticosteroid, ribavirin) is available online at www.cdc.gov/westnile/resources/pdfs/WNV-therapeutics-summary.pdf.

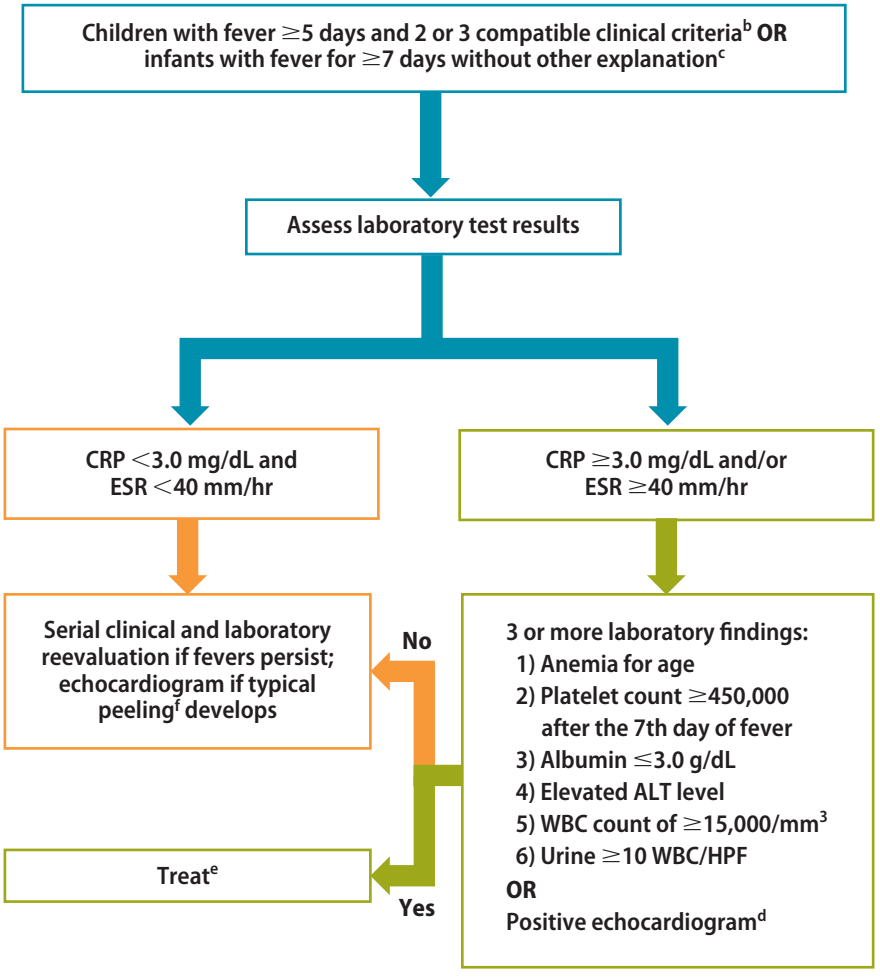
CMV indicates cytomegalovirus; FDA, US Food and Drug Administration; IG, Immune Globulin; IGIM, Immune Globulin Intramuscular; IGIV, Immune Globulin Intravenous; HAV, hepatitis A virus; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; HepA, hepatitis A vaccine; HepB, hepatitis B vaccine; TIG, Tetanus Immune Globulin; TSS, toxic shock syndrome; WNV, West Nile virus.

[a] IGIM should be administered deep into a large muscle mass. Ordinarily, no more than 5 mL should be administered in one site in an adult or large child; lesser amounts (maximum 3 mL in one site) should be administered to small children and infants.

[b] When using Immune Globulin Intravenous preparations, routine live-virus vaccines should be delayed because of potential interference with immune responses (see table on Suggested Intervals Between Immune Globulin Administration and Active Immunization With MMR, MMRV, or Monovalent Varicella Vaccines, p 13).

[c] See the chapter on Respiratory Syncytial Virus in the 2018 *Red Book* for the patient population in whom palivizumab prophylaxis is recommended.

Evaluation of Suspected Incomplete Kawasaki Disease[a]



CRP indicates C-reactive protein; ESR, erythrocyte sedimentation rate; ALT, alanine transaminase; WBC, white blood cell; HPF, high-powered field.

[a] In the absence of a "gold standard" for diagnosis, this algorithm cannot be evidence based but rather represents the informed opinion of the expert committee. Consultation with an expert should be sought any time assistance is needed.

[b] See next page for diagnostic criteria and clinical findings of Kawasaki disease.

[c] Infants 6 months of age are the most likely to develop prolonged fever without other clinical criteria for Kawasaki disease; these infants are at particularly high risk of developing coronary artery abnormalities.

[d] Echocardiography is considered positive for purposes of this algorithm if any of 3 conditions are met: *z* score of left anterior descending coronary artery or right coronary artery ≥2.5; coronary artery aneurysm is observed; or ≥3 other suggestive features exist, including decreased left ventricular function, mitral regurgitation, pericardial effusion, or *z* scores in left anterior descending coronary artery or right coronary artery of 2–2.5.

[e] Treatment should be given within 10 days of fever onset.

[f] Typical peeling begins under the nail beds of fingers and toes.

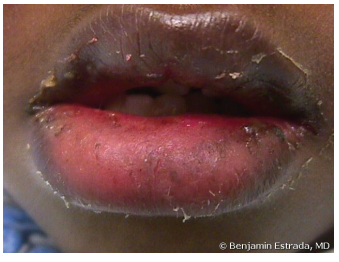
Reprinted with permission from McCrindle BW , Rowley AH , Newburger JW , et al; American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Cardiovascular Surgery and Anesthesia; and Council on Epidemiology and Prevention. Diagnosis, treatment, and long-term management of Kawasaki disease: a scientific statement for health professionals from the American Heart Association. *Circulation*. 2017;135:e927–e999.
© 2017 American Heart Association, Inc.

Diagnostic Criteria for Classic Kawasaki Disease

The diagnosis of classic (or complete) Kawasaki disease is based on the presence of 5 days of fever and at least 4 of the following principal features:

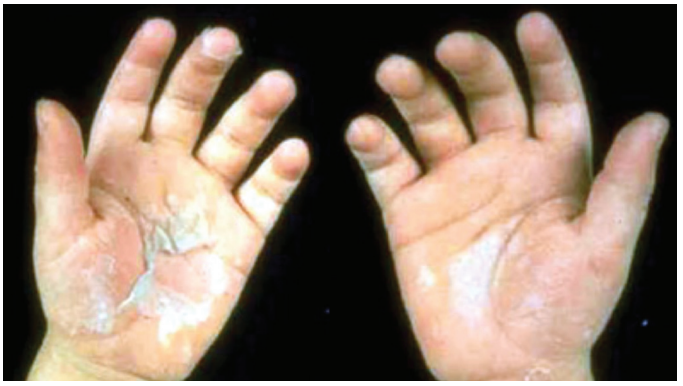
1. Bilateral injection of the bulbar conjunctivae with limbic sparing and without exudate
2. Erythematous mouth and pharynx, strawberry tongue, and red, cracked lips
3. A polymorphous, generalized, erythematous rash, often with accentuation in the groin, which can be morbilliform, maculopapular, scarlatiniform, or erythema multiforme-like
4. Changes in the peripheral extremities consisting of erythema of the palms and soles and firm, sometimes painful, induration of the hands and feet, often with periungual desquamation within 2 to 3 weeks after fever onset
5. Acute, nonsuppurative, usually unilateral, anterior cervical lymphadenopathy with at least 1 node 1.5 cm in diameter

Clinical Findings of Kawasaki Disease



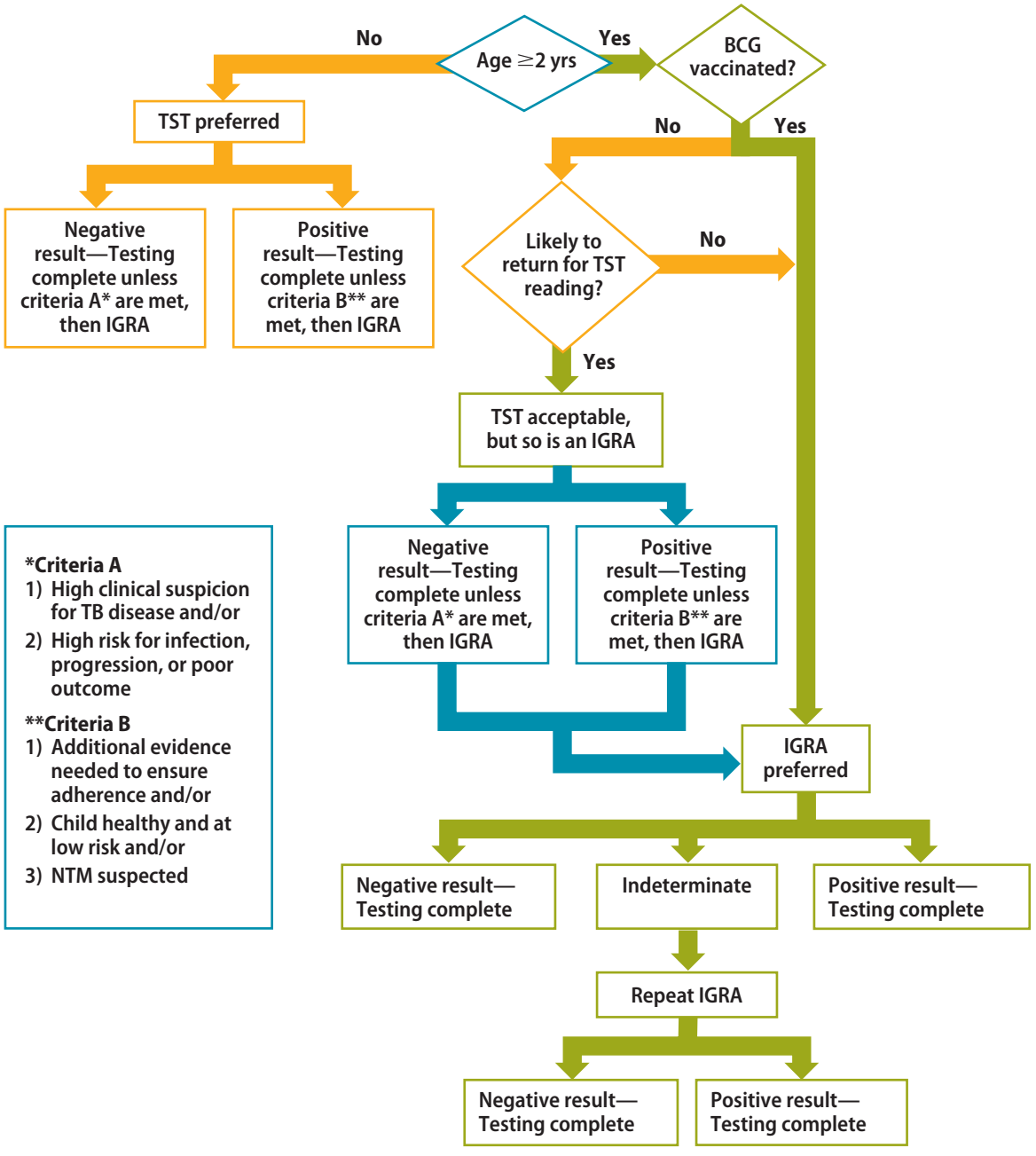
Mucositis in a 3-year-old African American child with Kawasaki disease.
Courtesy of Benjamin Estrada, MD

Bulbar conjunctivitis in a 3-year-old African American male with Kawasaki disease.
Courtesy of Benjamin Estrada, MD



A child with the characteristic desquamation of the hands in a later stage of Kawasaki disease.
Copyright Charles Prober, MD

Guidance on Strategy for Use of TST and IGRA for Diagnosis of LTBI by Age and BCG Immunization Status



BCG, Bacille Calmette-Guérin; IGRA, interferon-gamma release assay; LTBI, latent *M tuberculosis* infection; NTM, nontuberculous mycobacteria; TB, tuberculosis; TST, tuberculin skin test.

Validated Questions for Determining Risk of LTBI in Children in the United States

1. Has a family member or contact had tuberculosis disease?
2. Has a family member had a positive tuberculin skin test result?
3. Was your child born in a high-risk country (countries other than the United States, Canada, Australia, New Zealand, or Western and North European countries)?
4. Has your child traveled to a high-risk country? How much contact did your child have with the resident population?

LTBI indicates latent *M tuberculosis* infection.

Treatment Regimens for LTBI

Therapy	Frequency and Duration	Dosage	Comments
Isoniazid AND rifapentine, administered as directly observed therapy[a]	Once weekly for 12 wk	Isoniazid: 15 mg/kg rounded up to nearest 50 or 100 mg (max, 900 mg) Rifapentine: ▸ 10.0–14.0 kg: 300 mg ▸ 14.1–25.0 kg: 450 mg ▸ 25.1–32.0 kg: 600 mg ▸ 32.1–49.9 kg: 750 mg ▸ ≥50 kg: 900 mg max	▸ Should not be used in children younger than 2 y ▸ Most experts consider isoniazid-rifapentine to be the preferred regimen for treatment of LTBI for children 5 y and older, and some experts prefer isoniazid-rifapentine therapy for LTBI in children 2 y and older.
Rifampin	Daily for 4 mo	15–20 mg/kg (max, 600 mg)	
Isoniazid	Daily for 9 mo	10–15 mg/kg (max, 300 mg)	Contraindications: ▸ Patient received antituberculosis therapy previously ▸ Resistance to isoniazid is suspected or proven in source case ▸ Determine serum transaminase concentrations in patients with underlying liver or biliary disease, during pregnancy or the first 12 weeks postpartum, with concurrent use of other potentially hepatotoxic drugs, or if there is clinical concern of possible hepatotoxicity

LTBI indicates latent *M tuberculosis* infection.

[a] Dosage from Centers for Disease Control and Prevention. Recommendations for use of an isoniazid-rifapentine regimen with direct observation to treat latent *Mycobacterium tuberculosis* infection. *MMWR Morb Mortal Wkly Rep.* 2011;60(48):1650–1653.

Recommended Treatment of Lyme Disease in Children

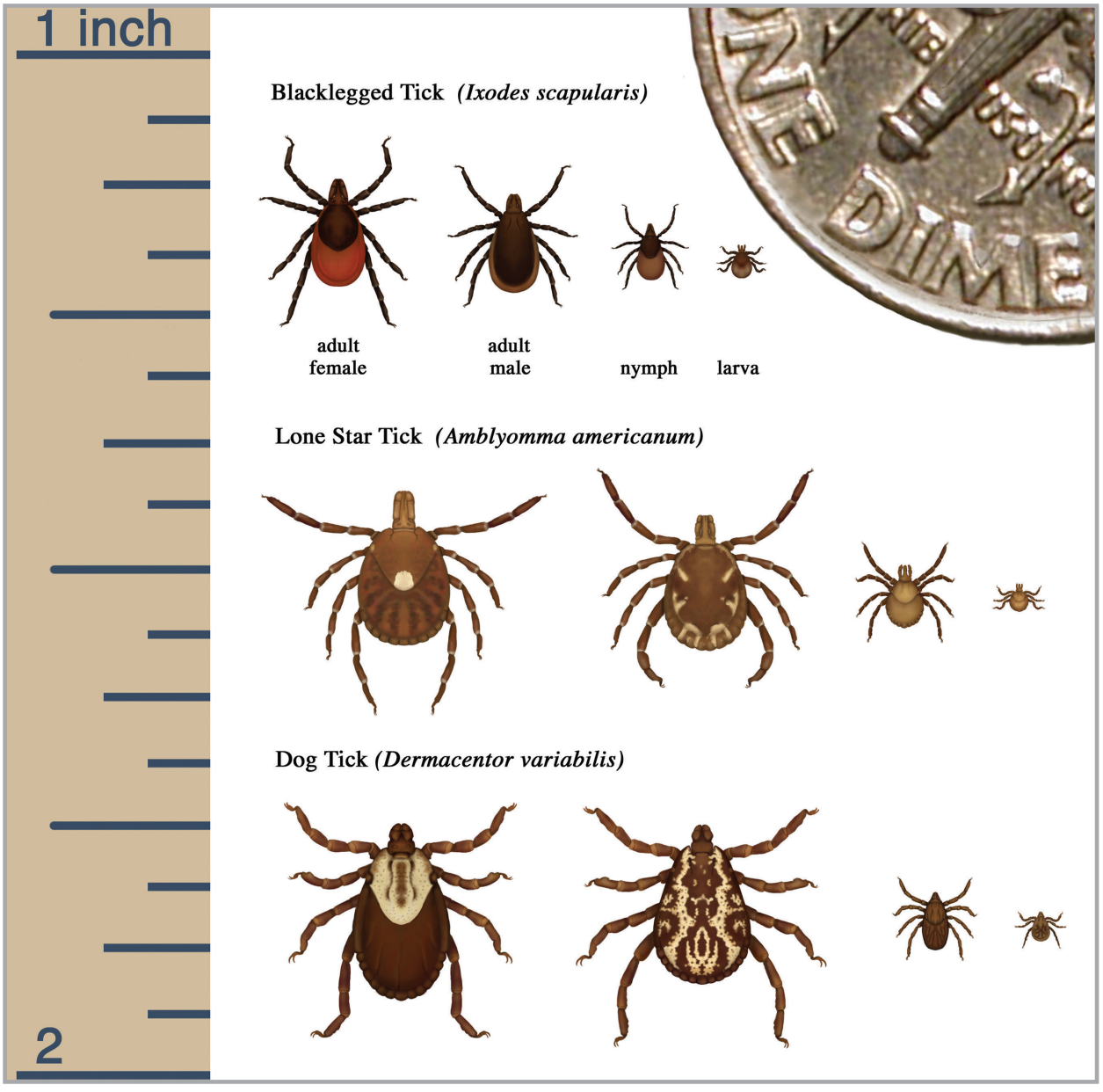
Disease Category	Drug(s) and Dose
Early localized disease	
Erythema migrans (single or multiple) (any age)	Doxycycline, 4.4 mg/kg per day, orally, divided into 2 doses (maximum 200 mg/day) for 10 days[a] **OR** Amoxicillin, 50 mg/kg per day, orally, divided into 3 doses (maximum 1.5 g/day) for 14 days[a] **OR** Cefuroxime, 30 mg/kg per day, orally, in 2 divided doses (maximum 1000 mg/day or 1 g/day) for 14 days[a] **OR,** for a patient unable to take a beta-lactam or doxycycline, Azithromycin, 10 mg/kg/day, orally, once daily for 7 days
Extracutaneous disease	
Isolated facial palsy	Doxycycline, 4.4 mg/kg per day, orally, divided into 2 doses (maximum 200 mg/day), for 14 days[a,b]
Arthritis	An oral agent as for early localized disease, for 28 days[c]
Persistent arthritis after first course of therapy	Retreat using an oral agent as for first-episode arthritis for 28 days[c] **OR** Ceftriaxone sodium, 50–75 mg/kg, IV, once a day (maximum 2 g/day) for 14–28 days
Atrioventricular heart block or carditis	An oral agent as for early localized disease, for 14 days (range 14–21 days) **OR** Ceftriaxone sodium, 50–75 mg/kg, IV, once a day (maximum 2 g/day) for 14 days (range 14–21 days for a hospitalized patient); oral therapy (using an agent as for early localized disease) can be substituted when the patient is stabilized or discharged, to complete the 14- to 21-day course
Meningitis	Doxycycline, 4.4 mg/kg per day, orally, divided into 1 or 2 doses (maximum 200 mg/day) for 14 days[a] **OR** Ceftriaxone sodium, 50–75 mg/kg, IV, once a day (maximum 2 g/day) for 14 days[a]

IV indicates intravenously.

[a] Represents a change from the 2006 Infectious Diseases Society of America (IDSA) guidelines by virtue of elimination of a longer range in duration of therapy of up to 21 days for erythema migrans, up to 21 days for facial palsy, and up to 28 days for meningitis or radiculopathy (Sanchez E, Vannier E, Wormser GP, Hu LT. Diagnosis, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: a review. *JAMA*. 2016;315(16):1767-1777).

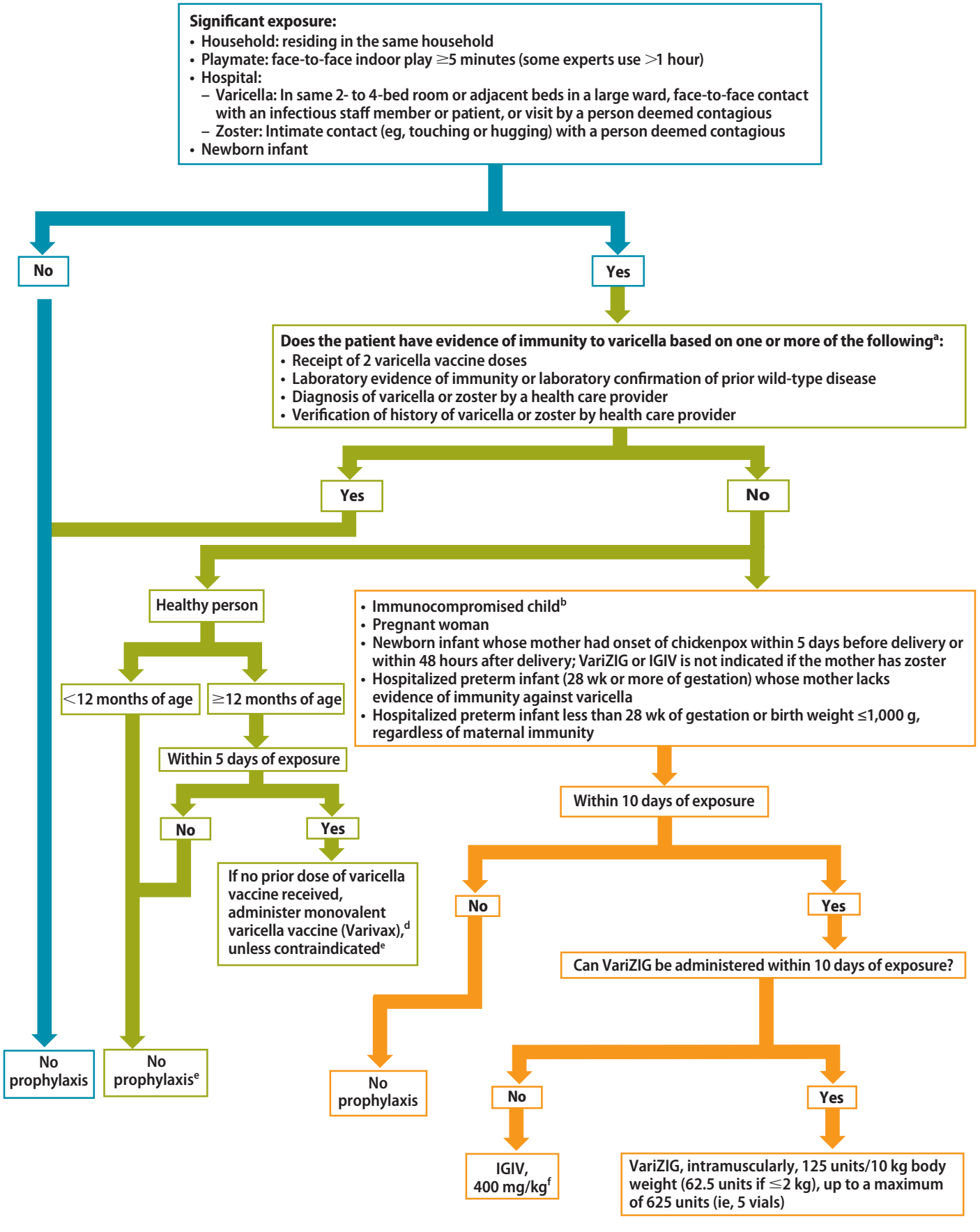
[b] Corticosteroids should not be given. Use of amoxicillin for facial palsy in children has not been studied. Treatment has no effect on the resolution of facial nerve palsy; its purpose is to prevent late disease.

[c] There are limited safety data on the use of doxycycline for >21 days in children <8 years of age.



This image shows the stages and relative sizes of these tick species. Only the blacklegged ticks are known to transmit Lyme disease. Courtesy of Centers for Disease Control and Prevention.

Management of Exposures to Varicella-Zoster Virus



Management of Exposures to Varicella-Zoster Virus

VariZIG indicates Varicella-Zoster Immune Globulin; IGIV, Immune Globulin Intravenous.

[a] People who receive hematopoietic stem cell transplants should be considered nonimmune regardless of previous history of varicella disease or varicella vaccination in themselves or in their donors.

[b] Immunocompromised children include those with congenital or acquired T-lymphocyte immunodeciency, including leukemia, lymphoma, and other malignant neoplasms aecting the bone marrow or lymphatic system; children receiving immunosuppressive therapy, including ≥2 mg/kg/day of systemic prednisone (or its equivalent) for ≥14 days; all children with human immunodeciency virus (HIV) infection regardless of CD4+ T-lymphocyte percentage; and all hematopoietic stem cell transplant patients regardless of pretransplant immunity status.

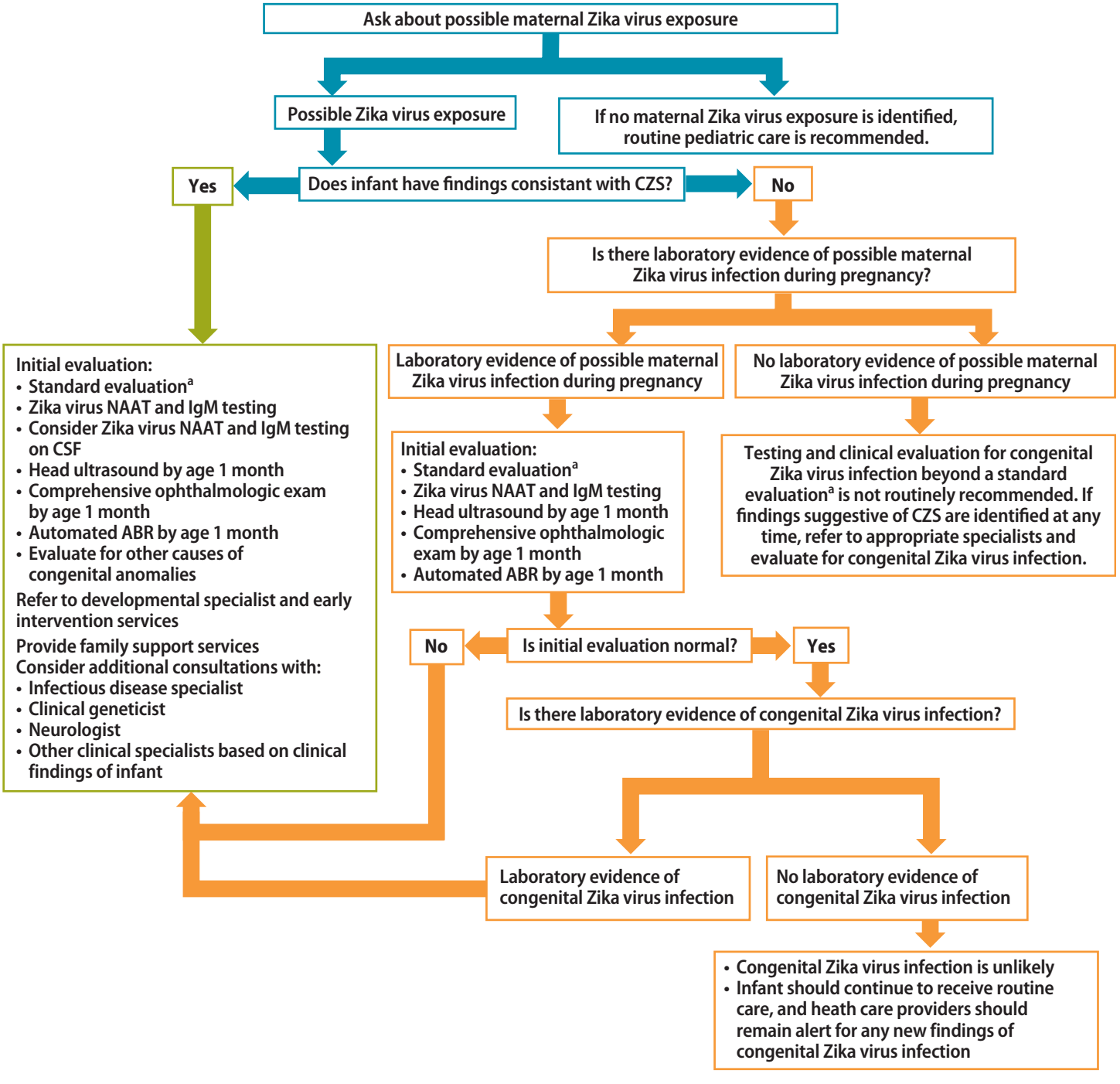
[c] If the exposed person is an adolescent or adult, has chronic illness, or there are other compelling reasons to try to avert varicella, some experts recommend preemptive therapy with oral acyclovir (20 mg/kg per dose administered 4 times per day, with a maximum daily dose of 3200 mg) or oral valacyclovir (if 3 months of age; 20 mg/kg per dose administered 3 times per day, with a maximum daily dose of 3000 mg) beginning 7 to 10 days aer exposure and continuing for 7 days. If the child is ≥12 months of age, age-appropriate vaccination still is recommended for protection against subsequent exposures, but vaccine should not be administered while antiviral therapy is being administered; if the exposure occurred during an outbreak, 2-dose vaccination is recommended for preschool-aged children younger than 4 years for outbreak control.

[d] If 1 prior dose of varicella vaccine has been received, a second dose should be administered at ≥4 years of age. If the exposure occurred during an outbreak, a second dose is recommended for preschool-aged children younger than 4 years for outbreak control if at least 3 months have passed after the first dose.

[e] Contraindications include patients who are allergic to a vaccine component, or who are immunocompromised (see footnote b), or pregnant. Caution should be used in patients receiving salicylates. Vaccine may not be as effective if patient has recently received Immune Globulin Intravenous, whole blood, or plasma transfusions, and for this reason, it is recommended that varicella vaccine be withheld for 3 to 11 months, depending on the dose, after administration of these products.

[f] If VariZIG and IGIV are not available, some experts recommend preemptive therapy with oral acyclovir (20 mg/kg per dose, administered 4 times per day, with a maximum daily dose of 3200 mg) or oral valacyclovir (if ≥3 months of age; 20 mg/kg per dose, administered 3 times per day, with a maximum daily dose of 3000 mg) beginning 7 to 10 days after exposure and continuing for 7 days. Preemptive oral acyclovir has only been studied in the normal host but sometimes is used in addition to VariZIG or IGIV in the immunocompromised host.

Recommendations for the Evaluation of Infants With Possible Congenital Zika Virus Infection Based on Infant Clinical Findings,[a,b] Maternal Testing Results,[c,d] and Infant Testing Results[e,f]—United States, October 2017



Recommendations for the Evaluation of Infants With Possible Congenital Zika Virus Infection Based on Infant Clinical Findings,[a,b] Maternal Testing Results,[c,d] and Infant Testing Results[e,f]—United States, October 2017

ABR refers to auditory brainstem response; CSF, cerebrospinal fluid; CZS, congenital Zika syndrome; IgM, immunoglobulin M; NAT, nucleic acid test; PRNT, plaque reduction neutralization test.

[a] All infants should receive a standard evaluation at birth and at each subsequent well-child visit by their health care providers, including (1) comprehensive physical examination, including growth parameters; and 2) age-appropriate vision screening and developmental monitoring and screening using validated tools. Infants should receive a standard newborn hearing screening at birth, preferably using auditory brainstem response.

[b] Automated ABR by age 1 month if newborn hearing screen passed but performed with otoacoustic emission methodology.

[c] Laboratory evidence of possible Zika virus infection during pregnancy is defined as (1) Zika virus infection detected by a Zika virus RNA NAAT on any maternal, placental, or fetal specimen (referred to as NAAT confirmed), or (2) diagnosis of Zika virus infection, timing of infection cannot be determined or unspecied Flavivirus infection, timing of infection cannot be determined by serologic tests on a maternal specimen (ie, positive/equivocal Zika virus IgM and Zika virus PRNT titer ≥10, regardless of dengue virus PRNT value; or negative Zika virus IgM, and positive or equivocal dengue virus IgM, and Zika virus PRNT titer ≥10, regardless of dengue virus PRNT titer). The use of PRNT for conrmation of Zika virus infection, including in pregnant women, is not routinely recommended in Puerto Rico (www.cdc.gov/zika/laboratories/lab-guidance.html).

[d] This group includes women who were never tested during pregnancy as well as those whose test result was negative because of issues related to timing or sensitivity and specicity of the test. Because the latter issues are not easily discerned, all mothers with possible exposure to Zika virus during pregnancy who do not have laboratory evidence of possible Zika virus infection, including those who tested negative with currently available technology, should be considered in this group.

[e] Laboratory testing of infants for Zika virus should be performed as early as possible, preferably within the first few days after birth, and includes concurrent Zika virus NAAT in infant serum and urine, and Zika virus IgM testing in serum. If CSF is obtained for other purposes, Zika virus NAAT and Zika virus IgM testing should be performed on CSF.

[f] Laboratory evidence of congenital Zika virus infection includes a positive Zika virus NAAT or a nonnegative Zika virus IgM with confirmatory neutralizing antibody testing, if PRNT confirmation is performed.

From Adebanjo T , Godfred-Cato S , Viens L , et al. Update: interim guidance for the diagnosis, evaluation, and management of infants with possible congenital Zika virus infection—United States, October 2017. *MMWR Morb Mortal Wkly Rep.* 2017;66(41):1089–1099

Fungal Species, Antifungal Drugs, Activity, Route, Clearance, CSF Penetration, Drug Monitoring Targets, and Adverse Events

Fungal Species	Amphotericin B Formulations	Fluconazole	Itraconazole	Voriconazole	Posaconazole	Isavuconazole	Flucytosine	Echinocandins[a]
Candida albicans	+	++	+	++	+	+/–	+	++
Candida tropicalis	+	++	+	++	+	+/–	+	++
Candida parapsilosis	++	++	+	++	+	+/–	+	+
Candida glabrata	+	–	–	–	+/–	+/–	+	+/–
Candida krusei	+	–	–	+	+	+/–	+	++
Candida lusitaniae	–	++	+	++	+	+/–	+	+
Candida guilliermondii	+	+	+	+	+	+/–	+	+/–
Candida auris	+/–	–	+/–	+/–	+	+	+/–	++
Cryptococcus species	++	++	+	+	+	+	++	–
Trichosporon species	+	+	+	++	+	+	–	–
Aspergillus fumigatus[b]	+	–	+	++	+	++	–	+
Aspergillus terreus[b]	–	–	+	++	+	++	–	+
Aspergillus calidoustus[b]	++	–	–	–	–	–	–	++
Fusarium species[b]	+	–	–	++	+	+	–	–
Mucor species[b]	++	–	+/–	–	+	+	–	–
Rhizopus species[b]	++	–	–	–	+	+	–	–
Scedosporium apiospermum[b]	–	–	+	++	+	+	–	–
Scedosporium prolificans[b]	–	–	+/–	+/–	+/–	+/–	–	–
Penicillium (Talaromyces) species[b]	+/–	–	++	+	+	+	–	–
Histoplasma capsulatum[c]	++	+	++	+	+	+	–	–
Coccidioides immitis[c]	++	++	++	+	+	+	–	–
Blastomyces dermatitidis[c]	++	+	++	+	+	+	–	–
Paracoccidioides species[c]	+	+	++	+	+	+	–	–
Sporothrix species[c]	+	+	++	+	+	+	–	–

Fungal Species, Antifungal Drugs, Activity, Route, Clearance, CSF Penetration, Drug Monitoring Targets, and Adverse Events (*cont*)

Fungal Species	Amphotericin B Formulations	Fluconazole	Itraconazole	Voriconazole	Posaconazole	Isavuconazole	Flucytosine	Echinocandins[a]
IV/PO	IV only	IV and PO	PO only	IV and PO	IV and PO	IV and PO[b]	PO only	IV only
Clearance	Renal	Renal/ hepatic	Hepatic	Hepatic	Hepatic	Hepatic	Renal	Hepatic (micafungin)
CSF penetration	Good	Good	Limited	Good	Minimal	Good	Good	Minimal
Therapeutic drug monitoring (treatment)	No	No	Trough 1–2 µg/mL (when measured by high-pressure liquid chromatography, both itraconazole and its bioactive hydroxy-itraconazole metabolite are reported, the sum of which should be considered in assessing drug levels)	Trough 2–6 µg/mL	Trough >0.7 µg/mL; higher rate of adverse effects when trough levels exceed 1 µg/mL	Unknown	Peak 40–80 µg/mL	No
Common adverse reactions	Infusion reaction, nephrotoxicity (watch potassium, magnesium); liposomal: hepatoxicity	Hepatotoxicity, increased QTc interval, headache, gastrointestinal tract effects	Hepatotoxicity, increased QTc interval; negative inotrope (avoid in congestive heart failure)	Hepatotoxicity, increased QTc interval, central nervous system effects, vision changes, phototoxicity	Hepatotoxicity, increased QTc interval, headache, gastrointestinal tract effects	Abdominal pain, nausea, diarrhea, conjunctivitis, flu-like illness	Neutropenia, hepatotoxicity (avoid in decreased renal function), gastrointestinal	Usually well tolerated; gastrointestinal tract effects, headache, hepatotoxicity

CSF, cerebrospinal fluid; IV, intravenous; PO, oral.

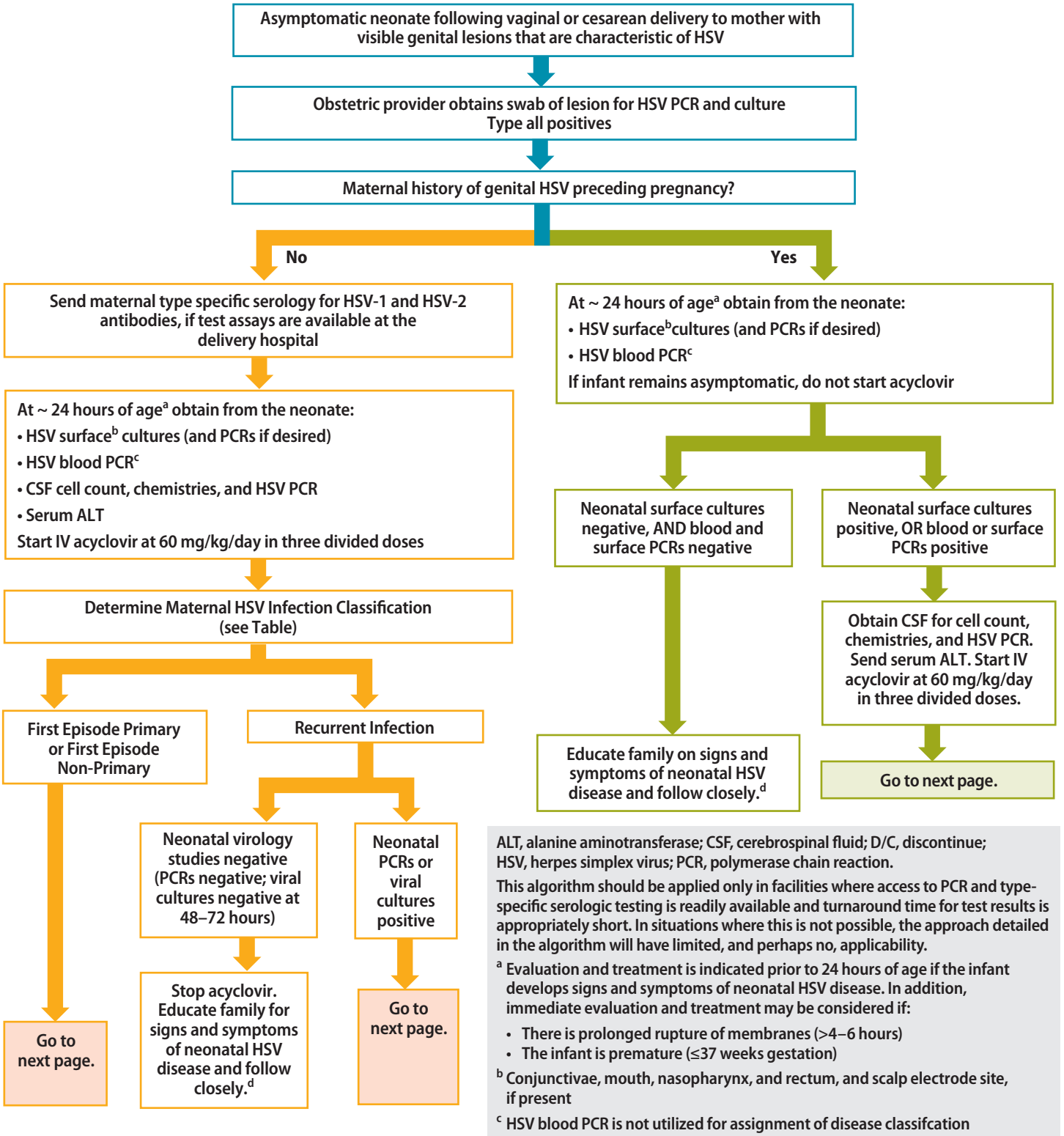
NOTE: ++, more active, scenario dependent; +, usually active; +/−, variably active; −, usually not active.

[a] Caspofungin, anidulafungin, and micafungin.

[b] Mold.

[c] Endemic fungi where mold/yeast phase is temperature-dependent.

Evaluation of Asymptomatic Neonates Following Vaginal or Cesarean Delivery to Women With Active Genital Herpes Lesions



ALT, alanine aminotransferase; CSF, cerebrospinal fluid; D/C, discontinue; HSV, herpes simplex virus; PCR, polymerase chain reaction.

This algorithm should be applied only in facilities where access to PCR and type-specific serologic testing is readily available and turnaround time for test results is appropriately short. In situations where this is not possible, the approach detailed in the algorithm will have limited, and perhaps no, applicability.

[a] Evaluation and treatment is indicated prior to 24 hours of age if the infant develops signs and symptoms of neonatal HSV disease. In addition, immediate evaluation and treatment may be considered if:

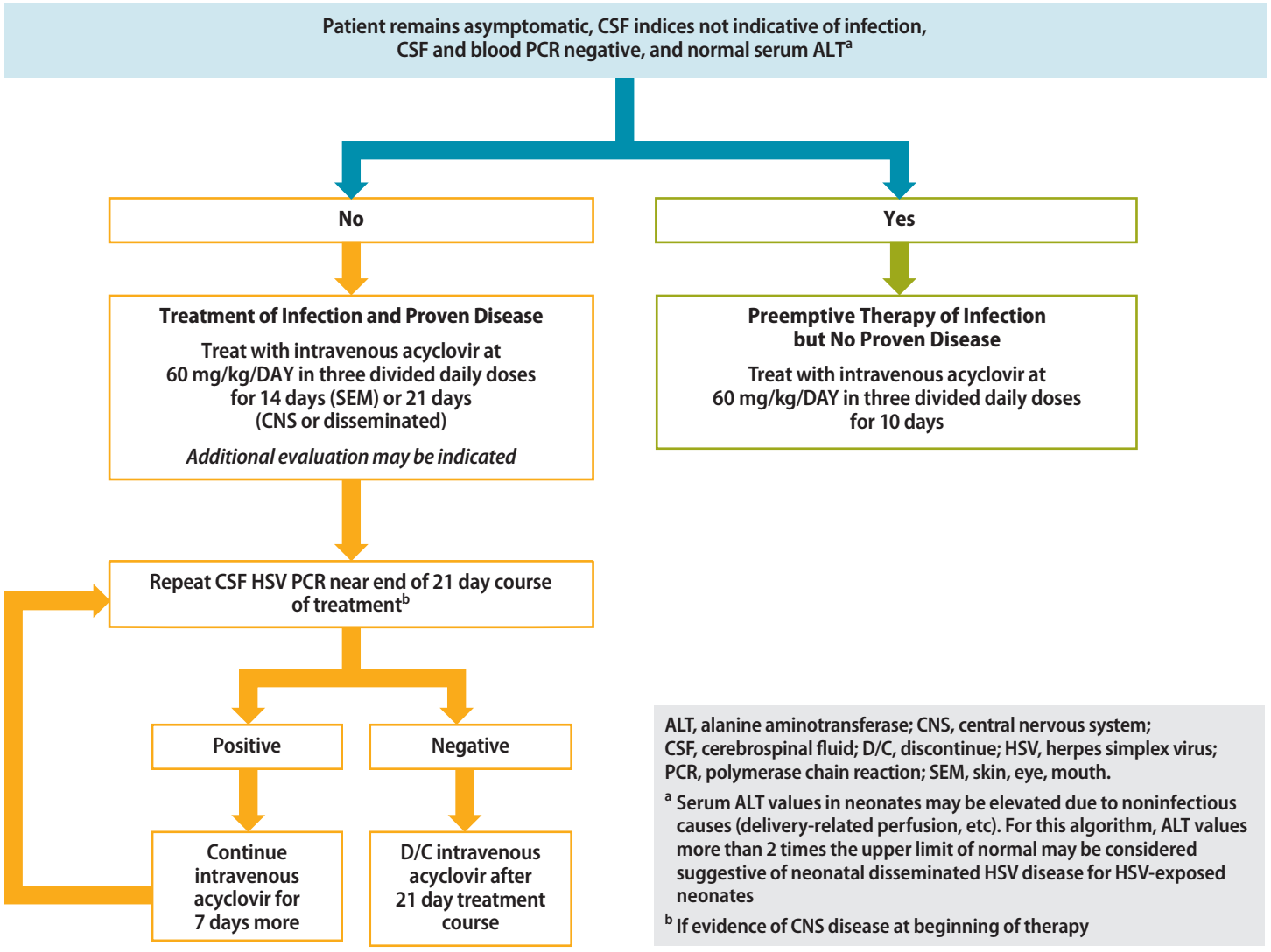
- There is prolonged rupture of membranes (>4–6 hours)
- The infant is premature (≤37 weeks gestation)

[b] Conjunctivae, mouth, nasopharynx, and rectum, and scalp electrode site, if present

[c] HSV blood PCR is not utilized for assignment of disease classifcation

[d] Discharge after 48 hours of negative HSV cultures (and negative PCRs) is acceptable if other discharge criteria have been met, there is ready access to medical care, and a person who is able to comply fully with instructions for home observation will be present. If any of these conditions is not met, the infant should be observed in the hospital until HSV cultures are finalized as negative or are negative for 96 hours after being set up in cell culture, whichever is shorter.

Reproduced from Kimberlin DW, Baley J; American Academy of Pediatrics Committee on Infectious Diseases. Guidance on management of asymptomatic neonates born to women with active genital herpes lesions. Pediatrics. 2013;131(2):e635–e646



ALT, alanine aminotransferase; CNS, central nervous system; CSF, cerebrospinal fluid; D/C, discontinue; HSV, herpes simplex virus; PCR, polymerase chain reaction; SEM, skin, eye, mouth.

[a] Serum ALT values in neonates may be elevated due to noninfectious causes (delivery-related perfusion, etc). For this algorithm, ALT values more than 2 times the upper limit of normal may be considered suggestive of neonatal disseminated HSV disease for HSV-exposed neonates

[b] If evidence of CNS disease at beginning of therapy

Reproduced from Kimberlin DW, Baley J; American Academy of Pediatrics Committee on Infectious Diseases. Guidance on management of asymptomatic neonates born to women with active genital herpes lesions. *Pediatrics.* 2013;131(2):e635–e646

Maternal Infection Classification by Genital HSV Virus Type and Maternal Serologic Test Results[a]

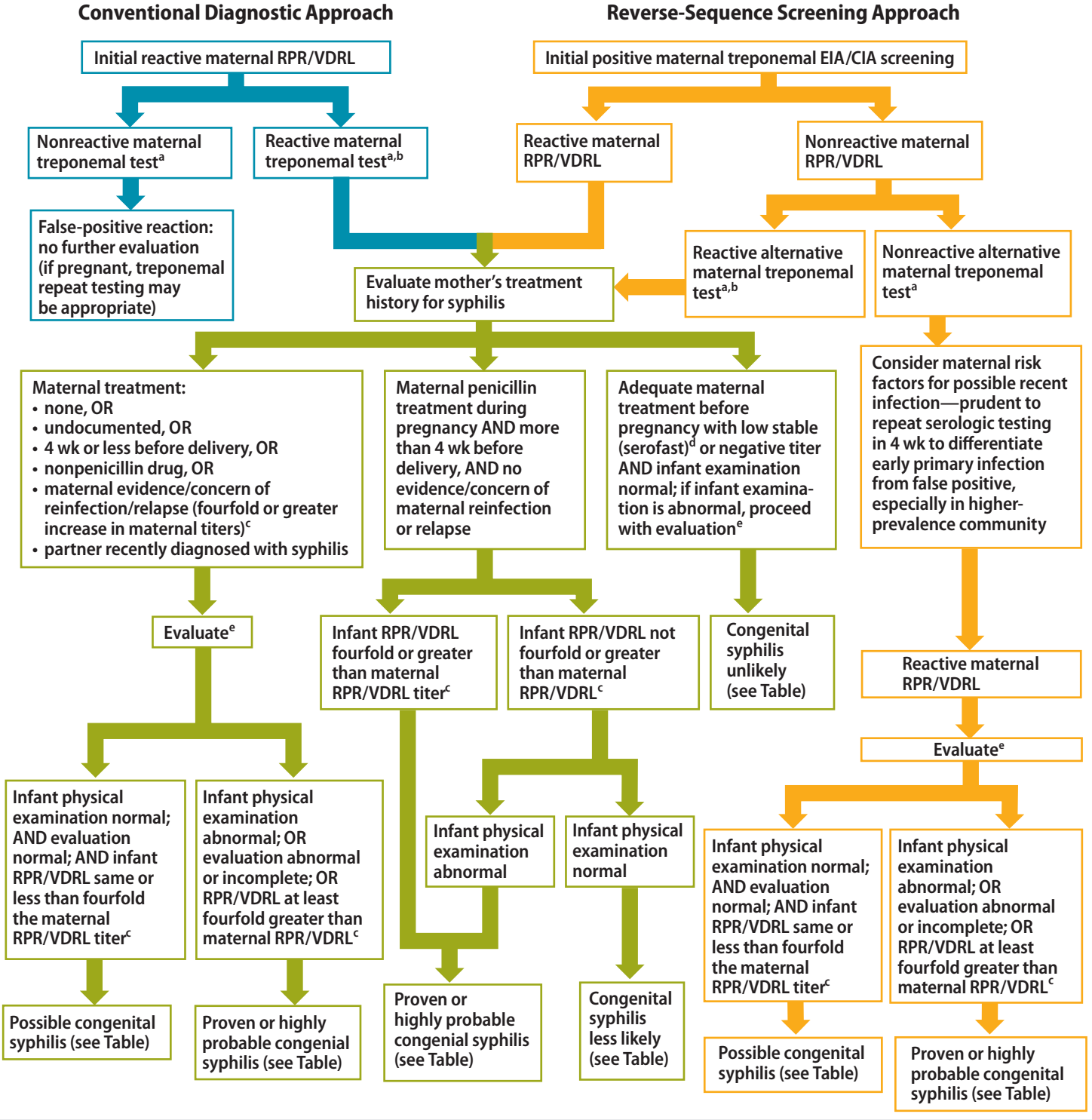
Classification of Maternal Infection	PCR/Culture From Genital Lesion	Maternal HSV-1 and HSV-2 IgG Antibody Status
Documented first-episode primary infection	▸ Positive, either virus	▸ Both negative
Documented first-episode nonprimary infection	▸ Positive for HSV-1	▸ Positive for HSV-2 **AND** negative for HSV-1
	▸ Positive for HSV-2	▸ Positive for HSV-1 **AND** negative for HSV-2
Assumed first-episode (primary or nonprimary) infection	▸ Positive for HSV-1 **OR** HSV-2	▸ Not available
	▸ Negative **OR** not available[b]	▸ Negative for HSV-1 and/or HSV-2, **OR** not available
Recurrent infection	▸ Positive for HSV-1	▸ Positive for HSV-1
	▸ Positive for HSV-2	▸ Positive for HSV-2

HSV indicates herpes simplex virus; PCR, polymerase chain reaction (assay); IgG, immunoglobulin G.

[a] To be used for women without a clinical history of genital herpes.

[b] When a genital lesion is strongly suspicious for HSV, clinical judgment should supersede the virologic test results for the conservative purposes of this neonatal management algorithm. Conversely, if, in retrospect, the genital lesion was not likely to be caused by HSV and the PCR assay result/culture is negative, departure from the evaluation and management in this conservative algorithm may be warranted.

Diagnostic Approach of Infants Born to Mothers With Reactive Serologic Tests for Syphilis



RPR indicates rapid plasma reagin; VDRL, Venereal Disease Research Laboratory; EIA, *Treponema pallidum* enzyme immunoassay; CIA, *T pallidum* chemiluminescent assay.

[a] *Treponema pallidum* particle agglutination (TP-PA) (which is the preferred treponemal test), fluorescent treponemal antibody absorption (FTA-ABS), or microhemagglutination test for antibodies to *T pallidum* (MHA-TP).

[b] Test for human immunodeciency virus (HIV) antibody. Infants of HIV-infected mothers do not require dierent evaluation or treatment for syphilis.

[c] A fourfold change in titer is the same as a change of 2 dilutions. For example, a titer of 1:64 is fourfold greater than a titer of 1:16, and a titer of 1:4 is fourfold lower than a titer of 1:16. When comparing titers, the same type of nontreponemal test should be used (eg, if the initial test was an RPR, the follow-up test should also be an RPR).

[d] Stable VDRL titers 1:2 or less or RPR 1:4 or less beyond 1 year after successful treatment are considered low serofast.

[e] Complete blood cell (CBC) and platelet count; cerebrospinal fluid (CSF) examination for cell count, protein, and quantitative VDRL; other tests as clinically indicated (eg, chest radiographs, long-bone radiographs, eye examination, liver function tests, neuroimaging, and auditory brainstem response).

Evaluation and Treatment of Infants With Possible, Probable, or Confirmed Congenital Syphilis

Category	Recommended Evaluation	Treatment
Proven or highly probable congenital syphilis	▸ CSF analysis CSF VDRL, cell count, and protein) ▸ CBC count with differential and platelet count ▸ Other tests (as clinically indicated): - Long-bone radiography - Chest radiography - Transaminases - Neuroimaging - Ophthalmologic examination - Auditory brain stem response	▸ Aqueous crystalline penicillin G, 50,000 U/kg, IV, every 12 hours (1 wk or younger), then every 8 h for infants older than 1 wk, for a total of 10 days of therapy[a] (preferred) **OR** ▸ Procaine penicillin G, 50,000 U/kg, IM, as single daily dose for 10 days
Possible congenital syphilis	▸ CSF analysis (CSF VDRL, CBC count, and protein) ▸ CBC count with differential and platelet count ▸ Long-bone radiography ▸ These evaluations may not be necessary if 10 days of parenteral therapy is administered	▸ Aqueous crystalline penicillin G, 50,000 U/kg, IV, every 12 h (1 wk or younger), then every 8 h for infants older than 1 wk, for a total of 10 days of therapy[a] (**preferred**) **OR** ▸ Procaine penicillin G, 50,000 U/kg, IM, as single daily dose for 10 days **OR** ▸ Benzathine penicillin G, 50,000 U/kg, IM, single dose (recommended by some experts, but **only** if all components of the evaluation are obtained and are normal, including normal CSF results[b] and follow-up is certain (some experts)
Congenital syphilis less likely	▸ Not recommended	▸ Benzathine penicillin G, 50,000 U/kg, IM, single dose (**preferred**) ▸ Alternatively, infants whose mother's nontreponemal titers decreased at least fourfold after appropriate therapy for early syphilis or remained stable at low titer (eg, VDRL ≤1:2; RPR ≤1:4) may be followed every 2–3 mo without treatment until the nontreponemal test becomes nonreactive ▸ Nontreponemal antibody titers should decrease by 3 mo of age and should be nonreactive by 6 mo of age whether the infant was infected and adequately treated or was not infected and initially seropositive because of transplacentally acquired maternal antibody. Patients with increasing titers or with persistent stable titers 6 to 12 mo after initial treatment should be re-evaluated, including a CSF examination, and treated with a 10-day course of parenteral penicillin G, even if they were treated previously.
Congenital syphilis is unlikely	▸ Not recommended	▸ No treatment required, but infants with reactive nontreponemal tests should be followed serologically to ensure test result returns to negative ▸ Benzathine penicillin G, 50,000 U/kg, IM, single dose can be considered if follow-up is uncertain and infant has a reactive test (some experts) ▸ Neonates with a negative nontreponemal test result at birth and whose mothers were seroreactive at delivery should be retested at 3 mo to rule out serologically negative incubating congenital syphilis at the time of birth

PCR indicates polymerase chain reaction; CSF, cerebrospinal fluid; CBC, complete blood cell count; VDRL, Venereal Disease Research Laboratory; IV, intravenously; IM, intramuscularly; RPR, rapid plasma reagin.

[a] If 24 hours or more of therapy is missed, the entire course must be restarted.

[b] If CSF is not obtained or uninterpretable (eg, bloody tap), a 10-day course is recommended.

Adapted from Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2015. *MMWR Recomm Rep.* 2015; 64(RR-3):45–47.

Immunization of Children and Adolescents With Primary and Secondary Immune Deficiencies

Category	Example of Specific Immunodeficiency	Vaccine Contraindications[a]	Comments
Primary			
B lymphocyte (humoral)	Severe antibody deficiencies (eg, X-linked agammaglobulinemia and common variable immunodeficiency)	OPV,[b] BCG, smallpox, YF, and live-bacteria vaccines[c]; no data for rotavirus vaccines	Effectiveness of any vaccine is uncertain if dependent only on humoral response (eg, PPSV23). Replacement IG therapy interferes with response to live vaccines MMR and VAR. Annual IIV is the only vaccine administered routinely to patients receiving IG replacement therapy. All inactivated vaccines are safe to administer as part of immune response assessment prior to instituting IG therapy.
	Less severe antibody deficiencies (eg, selective IgA deficiency and IgG subclass deficiencies)	OPV,[a] BCG, YF; other live-virus vaccines[d] (except YF) appear to be safe	All inactivated and live-virus vaccines on the standard annual schedule are safe, likely are effective (although responses may be attenuated), and should be administered.[e] PPSV23 should be administered beginning at 2 years of age.[f]
T lymphocyte (cell-mediated and humoral)	Complete defects (eg, severe combined immunodeficiency, complete DiGeorge syndrome)	All live-bacteria and live-virus vaccines (including rotavirus vaccine)[c,d,g]	All inactivated vaccines probably are ineffective. Annual IIV is the only vaccine administered routinely to patients receiving IG replacement therapy, if there is some residual antibody-producing capacity.
	Partial defects (eg, most patients with DiGeorge syndrome, hyperIgM syndrome, Wiskott-Aldrich syndrome, ataxia telangiectasia)	All live-bacteria and live-virus vaccines[c,d,g]	All inactivated vaccines on the standard annual schedule are safe, may be effective depending on the degree of the immune defect, and should be administered.[e] Those with ≥500 CD3+ T lymphocytes/mm^3, ≥200 CD8+ T lymphocytes/mm^3, and normal mitogen response could be considered to receive MMR and VAR vaccine (but not MMRV). PPSV23 should be administered beginning at 2 years of age.[f] Consider MenACWY-CRM series beginning in infancy[h]; and the MenB series beginning at 10 years of age depending on splenic dysfunction.
	Interferon-alpha; interferon-gamma; interleukin 12 axis deficiencies; STAT1 deficiencies	All live-bacteria vaccines[c] and YF vaccine; other live-virus vaccines[d] if severely lymphopenic	All inactivated vaccines on the standard annual schedule are safe, likely are effective, and should be administered.[e] Based on experience in HIV-infected children with the measles vaccine, MMR and VAR (but not MMRV) probably are safe and may be preferable to the risk of disease. Inactivated typhoid vaccine (Typhoid Vi) is considered for people living in areas with endemic typhoid.
Complement	Persistent complement component, properdin, mannan-binding lectin, or factor B deficiency; secondary deficiency because receiving eculizumab (Soliris)	None	All inactivated and live-virus vaccines on the standard annual schedule are safe, likely are effective, and should be administered.[e] PPSV23 should be administered beginning at 2 years of age[f]; MenACWY-CRM series beginning in infancy[h]; and the MenB series beginning at 10 years of age.
Phagocytic function	Chronic granulomatous disease	Live-bacteria vaccines[c]	All inactivated and live-virus vaccines[d] on the standard annual schedule are safe, likely are effective, and should be administered.[e,i]
	Phagocytic deficiencies that are ill-defined or accompanied by defects in T-lymphocyte and natural killer cell dysfunction (such as Chediak-Higashi syndrome, leukocyte adhesion defects, and myeloperoxidase deficiency)	All live-bacteria[c] and live-virus vaccines[d]	All inactivated vaccines on the standard annual schedule are safe, likely are effective, and should be administered. PPSV23 should be administered beginning at 2 years of age.[f] Consider MenACWY-CRM series beginning in infancy[h]; and the MenB series beginning at 10 years of age depending on splenic dysfunction.
Secondary			
	HIV/AIDS	OPV,[a] smallpox, BCG, MMRV, MMR, VAR in highly immunocompromised children; YF vaccine may have a contraindication or precaution depending on indicators of immune function[j]	All inactivated vaccines on the standard annual schedule are safe, may be effective, and should be administered.[e] Rotavirus vaccine should be administered on the standard schedule. MMR and VAR are recommended for HIV-infected children who are asymptomatic or have only low-level immunocompromise.[k] PPSV23 should be administered beginning at 2 years of age.[f] MenACWY series should be administered beginning in infancy.[h] Hib is indicated for under-/unimmunized children ≥5 years of age.[l]

Immunization of Children and Adolescents With Primary and Secondary Immune Deficiencies (*cont*)

Category	Example of Specific Immunodeficiency	Vaccine Contraindications[a]	Comments
***Secondary* (*cont*)**			
	Malignancy, transplantation, autoimmune disease, immunosuppressive or radiation therapy	All live-virus and live-bacteria vaccines, depending on immune status[c,d]	Refer to the 2018 *Red Book* for guidance. All inactivated vaccines on the standard annual schedule are safe, and may be effective depending on degree of immunocompromise.[e] Annual IIV is recommended unless receiving intensive chemotherapy or anti–B cell antibodies. PPSV23 should be administered beginning at 2 years of age.[f] Hib vaccine is indicated in under-/unimmunized children <5 years of age only.[e]
	Asplenia (functional, congenital anatomic, surgical)	None	All inactivated and live-virus vaccines on the standard annual schedule are safe, likely are effective, and should be administered.[e] PPSV23 should be administered beginning at 2 years of age[f]; MenACWY-CRM series beginning in infancy[h]; and the MenB series beginning at 10 years of age. Hib vaccine is indicated for under-/unimmunized children ≥5 years of age.[l]
	Chronic renal failure	None	All inactivated and live-virus vaccines on the standard annual immunization schedule are safe, likely are effective, and should be administered.[e] PPSV23 should be administered beginning at 2 years of age.[f] HepB is indicated if not previously immunized.
	CNS anatomic barrier defect (cochlear implant, congenital dysplasia of the inner ear, persistent CSF communication with naso-/oropharynx)	None	All inactivated and live-virus vaccines on the standard annual immunization schedule are safe and effective, and should be administered.[e] PPSV23 should be administered beginning at 2 years of age.[f]

OPV indicates oral poliovirus; BCG, bacille Calmette-Guérin; YF, yellow fever; PPSV23, 23-valent pneumococcal polysaccharide vaccine; IG, Immune Globulin; MMR, measles-mumps-rubella vaccine; VAR, varicella vaccine; IIV, inactivated influenza vaccine; IgA, immunoglobulin A; IgG, immunoglobulin G; MMRV, mesles-mumps-rubella-varicella vaccine; MenACWY, meningococcal conjugate vaccine containing serogroups ACWY; MenB, serogroup B meningococcal vaccine; STAT1, signal transducer and activator of transcription 1; HIV, human immunodeficiency virus; AIDS, acquired immune deficiency syndrome; Hib, *Haemophilus influenzae* type b vaccine; HepB, hepatitis B vaccine; CNS, central nervous system; CSF, cerebrospinal fluid.

[a] This table refers to contraindications for nonemergency vaccination (ie, recommendations of the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention).

[b] OPV vaccine no longer is available in the United States.

[c] Live-bacteria vaccines: BCG and Ty21a *Salmonella Typhi* vaccine.

[d] Live-virus vaccines: MMR, VAR, MMRV, OPV, YF, vaccinia (smallpox), and rotavirus. Except for severe T-lymphocyte deficiency, data to contraindicate rotavirus vaccine are lacking; the immunocompromised state generally is considered a precaution for rotavirus vaccine. LAIV is not indicated for any person with a potentially immunocompromising condition.

[e] Children who are underimmunized or unimmunized for age should receive routinely recommended vaccines, according to age and the catch-up schedule, with urgency to administer needed Hib and PCV13.

[f] PPSV23 is begun at ≥2 years of age. If PCV13 is required (ie, for children <6 years who have not received all required doses, and for those ≥6 years of age who never received PCV13), PCV13 dose(s) should be administered first, followed by PPSV23 at least 8 weeks later; a second dose of PPSV23 is administered 5 years after the first.

[g] Regarding T-lymphocyte immunodeficiency as a contraindication to rotavirus vaccine, data only exist for severe combined immunodeficiency syndrome.

[h] Age and schedule of doses depends on the product; repeated doses are required.

[i] Additional pneumococcal vaccine is not indicated for children with chronic granulomatous disease beyond age-based standard recommendations for PCV13, because these children are not at increased risk of pneumococcal disease.

[j] YF vaccine is contraindicated in HIV-infected children younger than 6 years who are highly immunosuppressed. There is a precaution for use of YF vaccine in asymptomatic HIV-infected children younger than 6 years with total lymphocyte percentage of 15%–24%, and older than 6 years with CD4+ T-lymphocyte counts of 200–499 cells/mm^3 (Centers for Disease Control and Prevention. Yellow fever vaccine: recommendations of the Advisory Committee on Immunization Practices [ACIP]. *MMWR Recomm Rep.* 2010;59[RR-07];1–27).

[k] Live-virus vaccines (measles-mumps-rubella [MMR] and varicella) can be administered to asymptomatic HIV-infected children and adolescents without severe immunosuppression (that is, can be administered to children 1 through 13 years of age with a CD4+ T-lymphocyte percentage ≥15% and to adolescents ≥14 years of age with a CD4+ T-lymphocyte count ≥200 lymphocytes/mm^3). Severely immunocompromised HIV-infected infants, children, adolescents, and young adults (eg, children 1 through 13 years of age with a CD4+ T-lymphocyte percentage <15% and adolescents ≥14 years of age with a CD4+ T-lymphocyte count <200 lymphocytes/mm^3) should not receive measles virus–containing vaccine, because vaccine-related pneumonia has been reported. The quadrivalent measles-mumps-rubella-varicella (MMRV) vaccine should not be administered to any HIV-infected infant, regardless of degree of immunosuppression, because of lack of safety data in this population.

[l] A single dose of Hib vaccine is indicated for unimmunized children and adolescents ≥5 years of age (children and adolescents who have not received a primary series and booster dose or at least 1 dose of Hib vaccine after 14 months of age are considered unimmunized) who have anatomic or functional asplenia (including sickle cell disease), who will undergo splenectomy, or who have HIV infection.

Red Book® Pediatric Infectious Diseases Clinical Decision Support Chart

Editor
David W. Kimberlin, MD, FAAP

For more than 8 decades, the recommendations in the American Academy of Pediatrics (AAP) *Red Book* have enabled physicians and other pediatric health care professionals to provide the best possible care to children presenting with infectious diseases.

Among the most helpful and popular features of the *Red Book* are its tables, algorithms, charts, and graphs. To make these tools more accessible and user-friendly at the point of care, the AAP is pleased to introduce the new *Red Book® Pediatric Infectious Diseases Clinical Decision Support Chart.*

This all-new resource collects many of the most clinically useful tables, algorithms, and other items from the latest edition of the *Red Book* and presents them in an enlarged, enhanced, colorized format that is lightweight, portable, and easy to navigate. Additionally, new tables have been created exclusively for this chart, synthesizing important clinical information from the *Red Book* text.

The content featured in these 15 information-rich tabs has been reviewed by the *Red Book* editors to ensure consistency with AAP policy.

Topics include:

- Staphylococcal Infections
- Streptococcal Infections
- Diarrheal Infections
- Immunizations
- Antibiotic Prophylaxis
- Immune Globulin
- Kawasaki Disease
- Tuberculosis
- Lyme Disease
- Varicella-Zoster
- Zika
- Fungal Infections
- Genital and Neonatal Herpes
- Syphilis
- Immunocompromised Children and Adolescents

About the editor

David W. Kimberlin, MD, FAAP is Editor of the 2018 AAP Report of the Committee on Infectious Diseases (Red Book). He also was Editor of the 2015 edition, and was an Associate Editor of the 2012 and 2009 editions. Dr. Kimberlin is Past-President of the Pediatric Infectious Diseases Society (PIDS), which is the world's largest organization of professionals dedicated to the treatment, control, and eradication of infectious diseases affecting children. He also serves as Vice Chair for Clinical and Translational Research in the UAB Department of Pediatrics, where heholds the Sergio Stagno Endowed Chair in Pediatric Infectious Diseases and is Co-Director of the Division of Pediatric Infectious Diseases.

Additional Red Book and infectious disease products from the American Academy of Pediatrics:

- ***Red Book®: 2018-2021 Report of the Committee on Infectious Diseases,* 31st Edition**
- ***Red Book Atlas of Pediatric Infectious Diseases,* 3rd Edition**
- ***Managing Infectious Diseases in Child Care and Schools,* 4th Edition**
- ***2019 Nelson's Pediatric Antimicrobial Therapy,* 25th Edition**

To order these and other pediatric infectious disease resources, visit shop.aap.org.

shopAAP
shop.aap.org

ISBN 978-1-61002-305-4
90000>
9 781610 023054

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®