IDSA Diarrhea Guidelines

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Infectious Diseases Society of America

IDSA
Infectious Diseases Society of America

Strategic Priorities…

- Establishing state of the art clinical guidelines
- Advocating for ID prevention and public health funding
- Leading the way in antimicrobial stewardship and addressing resistance

IDSA
Infectious Diseases Society of America

Strategic Priorities…

- Promoting the value of ID Specialists
- Bringing the best and brightest into our field
- Putting ID and HIV research front, center, and into practice

Disclosure

- I have no disclosures

Objectives

- Highlight the structure of the 2017 IDSA Clinical Practice Guidelines for diagnosis and management of infectious diarrhea
- Replace IDSA guidelines published in 2001
- Discuss the impact of infectious diarrhea on clinical practice and public health
- Update diagnosis and treatment

Promote Timely & Relevant **Guidelines**

- Implementing adherence to GRADE Methodology for all IDSA Practice Guidelines
- Have increased staff resources and technical expertise to make guideline development process more efficient

Panel Composition for Diarrhea Guidelines

- Karen Kotloff
- Joseph Cantey
- Allen Chang
- John Crump
- Joanne Langley
- Rajal Mody
- Larry Pickering*
- Andi Shane*
- Theodore Steiner
- Christine Wanke
- Cirle Warren
- Phillip Tarr

Practice Guidelines

IDSA

The Infectious Diseases Society of America (IDSA) represents physicians, scientists and other health care professionals who specialize in infectious diseases. IDSA's purpose is to improve the health of individuals, communities, and society by promoting excellence in patient care, education, research, public health, and prevention relating to infectious diseases.

- **Practice guidelines are systematically developed statements to assist practitioners and patients in making decisions about appropriate health care for specific clinical circumstances.**
- **Attributes of good guidelines include validity, reliability, reproducibility, clinical applicability, clinical flexibility, clarity, multidisciplinary process, review of evidence, and documentation.**

[Institute of Medicine Committee to Advise the Public Health Service on Clinical Practice Guidelines, 1990]

GRADE Approach

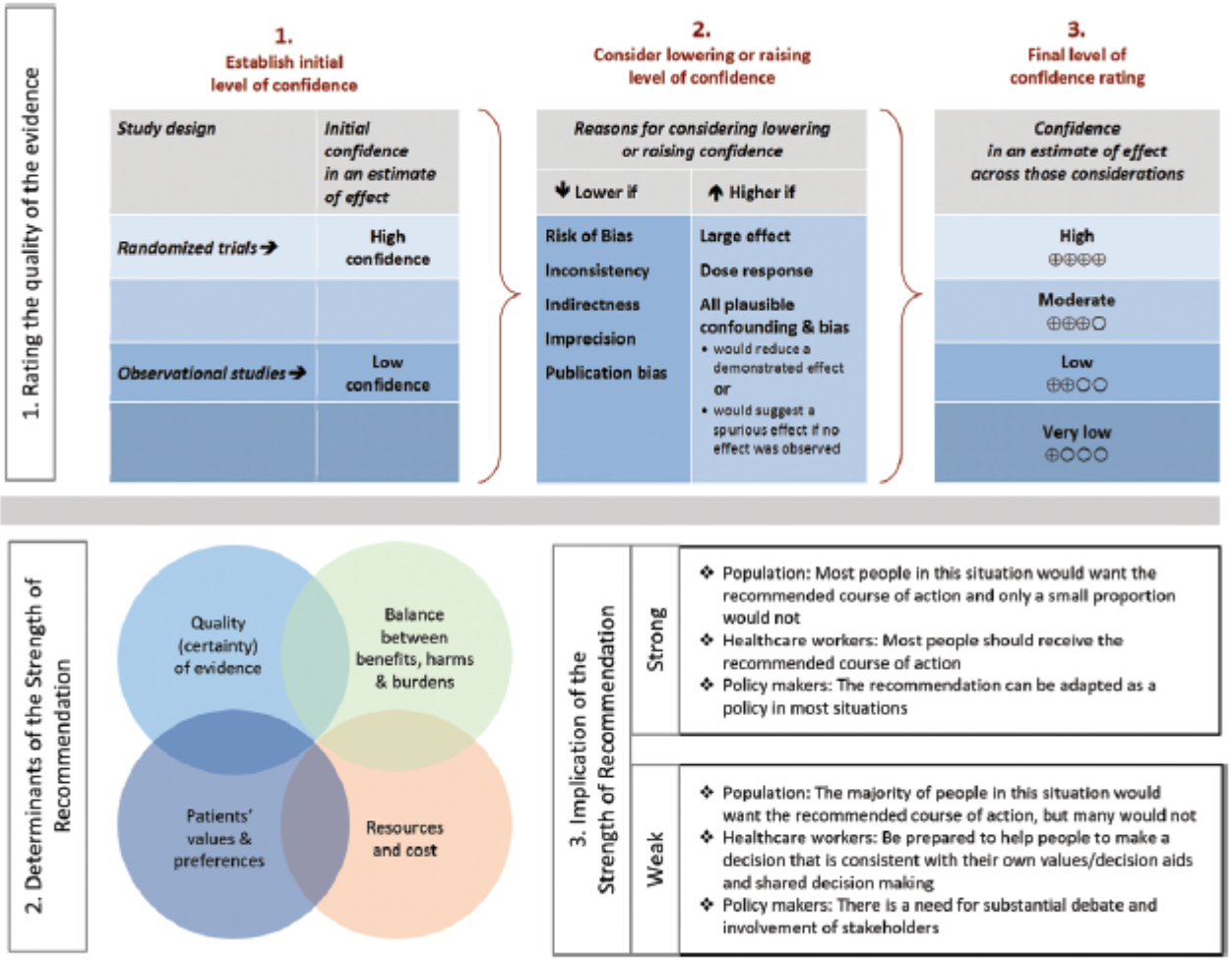

Figure 2. Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

Considerations When Evaluating People With Infectious Diarrhea

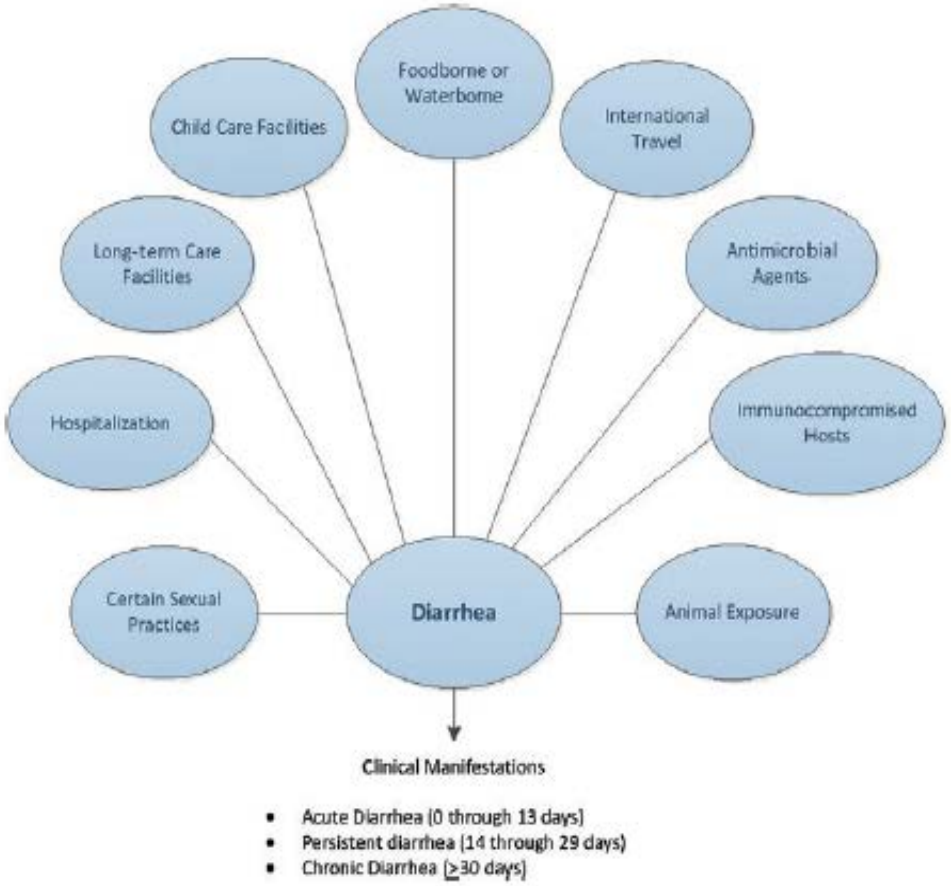

Figure 1. Considerations when evaluating people with infectious diarrhea. Modified from Long SS, Pickering LK, Pober CG, eds. Principles and Practice of Pediatric Infectious Diseases, 4th ed. New York: Elsevier Saunders, 2012.

Structure of the Diarrhea Guidelines

- Clinical, demographic and epidemiologic features (10 headings with 29 recommendations)
- Empiric management of infectious diarrhea (2 headings with 8 recommendations)
- Directed management of infectious diarrhea (1 heading with 1 recommendation)
- Supportive treatment (2 headings with 7 recommendations)
- Ancillary management (3 headings with 6 recommendations
- Prevention (3 headings with 9 recommendations)

Burden of diarrheal diseases in the U.S.

- 179 million outpatient visits
- 500,000 hospitalizations
- 5,000 deaths
- Norovirus and *Salmonella enterica* subspecies were the leading pathogens among the 24 gastrointestinal tract pathogens transmitted by food
- Missing organisms: rotavirus (vaccine) and norovirus (not reportable)

Summary of Top 10 Nationally Notifiable Diseases in the United States, 2015

- Three cause gastroenteritis (Salmonella, Shigella, Giardia) (missing are rotavirus (vaccine) and norovirus (not reportable)
- Four are sexually transmitted
- Two are vaccine-preventable
- One is caused by a tickborne spirochete
- All 10 involve children, adolescents, and adults

Tables included in guidelines

1. Modes of acquisition of enteric organisms and sources of guidelines
2. Exposure or condition associated with pathogens causing diarrhea
3. Clinical presentations suggestive of infectious diarrhea etiologies
4. Post-infectious manifestations associated with enteric pathogens
5. Laboratory diagnostics for organisms associated with infectious diarrhea
6. Recommended antimicrobial agents by pathogen
7. Fluid and nutritional management of diarrhea

Table 1: Modes of Acquisition of Enteric Organisms and Sources of Guidelines

Table 1. Modes of Acquisition of Enteric Organisms and Sources of Guidelines

Mode	Title	URL	Author/Issuing Agency
International travel	Expert Review of the Evidence Base for Prevention of Travelers' Diarrhea	http://www.ncbi.nlm.nih.gov/pubmed/19538575	DuPont et al [113]
	Medical Considerations Before International Travel	http://www.ncbi.nlm.nih.gov/pubmed/27468061	Freedman et al [207]
	The Yellow Book	http://wwwnc.cdc.gov/travel/page/yellowbook-home-2014	CDC
	Travelers Health	http://wwwnc.cdc.gov/travel	CDC
Immunocompromised hosts	Guidelines for the Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents	http://aidsinfo.nih.gov/contentfiles/lvguidelines/adult_oi.pdf	CDC/NIH/HIVMA/IDSA
	Guidelines for the Prevention and Treatment of Opportunistic Infections in HIV-Exposed and HIV-Infected Children	http://aidsinfo.nih.gov/contentfiles/lvguidelines/oi_guidelines_pediatrics.pdf	CDC/NIH/HIVMA/IDSA
Foodborne and waterborne	Surveillance for Foodborne Disease Outbreaks—United States, 2009–2010	http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6203a1.htm?s_cid=mm6203a1_w	CDC
	Food Safety	http://www.cdc.gov/foodsafety/	CDC
	Healthy Water	http://wwwnc.cdc.gov/healthywater	CDC
Antimicrobial-associated (*C. difficile*)	Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults and Children 2017 Update (In press)	http://www.jstor.org/stable/10.1086/651706	IDSA/SHEA
	2010 Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults	https://www.idsociety.org/Organ_System/#ClostridiumDifficile	IDSA/SHEA
Healthcare-associated	Healthcare-Associated Infections	http://www.cdc.gov/hai/	CDC
Child care settings	Caring for Our Children: National Health and Safety Performance Standards; Guidelines for Early Care and Education Programs	http://nrckids.org.	AAP, APHA, NRC
	Recommendations for Care of Children in Special Circumstances—Children in Out-of-Home Child Care (pp 132–51)	http://redbook.solutions.aap.org/redbook.aspx	AAP
	Managing Infectious Diseases in Child Care and Schools	http://ebooks.aappublications.org/content/managing-infectious-diseases-in-child-care-and-schools-3rd-edition	AAP
Long-term care settings	Nursing Homes and Assisted Living (Long-term Care Facilities)	http://www.cdc.gov/longtermcare/	CDC
	Infection Prevention and Control in the Long-term Care Facility	http://www.shea-online.org/assets/files/position-papers/ic-itcf97.pdf	SHEA/APIC
Zoonoses	Compendium of Measures to Prevent Disease Associated With Animals in Public Settings	http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6004a1.htm?s_cid=rr6004a1_w	CDC
	Exposure to Nontraditional Pets at Home and to Animals in Public Settings: Risks to Children	http://pediatrics.aappublications.org/content/122/4/876	Pickering et al [51]
	Review of Institute of Medicine and National Research Council Recommendations for One Health Initiative	http://wwwnc.cdc.gov/eid/article/19/12/12-1659_article.htm	Rubin et al [208]

Abbreviations: AAP, American Academy of Pediatrics; APHA, American Public Health Association; APIC, Association for Professionals in Infection Control and Epidemiology; CDC, Centers for Disease Control and Prevention; HIV, human immunodeficiency virus; HIVMA, HIV Medicine Association; IDSA, Infectious Diseases Society of America; NIH, National Institutes of Health; NRC, National Resource Center for Health and Safety in Child Care and Early Education; SHEA, Society for Healthcare Epidemiology of America.

Modes of Acquisition of Enteric Organisms

- International travel
- Immunocompromised hosts
- Foodborne and waterborne
- Antimicrobial associated C.difficile)
- Healthcare associated
- Child care settings
- Long term care settings
- Zoonoses

Diseases Associated with Raw Milk

Before milk pasteurized in 1920s	Tuberculosis Diphtheria Severe streptococcal infections Typhoid fever
Current diseases	Campylobacter 55% Salmonella 22% STEC 14% Listeria/Brucella/Shigella each 3%

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

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

POLICY STATEMENT

Consumption of Raw or Unpasteurized Milk and Milk Products by Pregnant Women and Children

COMMITTEE ON INFECTIOUS DISEASES and COMMITTEE ON NUTRITION

KEY WORDS
raw milk/milk products, unpasteurized milk/milk products, pregnant women, children

ABBREVIATIONS
AAP—American Academy of Pediatrics
FDA—Food and Drug Administration

abstract

FREE

Sales of raw or unpasteurized milk and milk products are still legal in at least 30 states in the United States. Raw milk and milk products from cows, goats, and sheep continue to be a source of bacterial infections attributable to a number of virulent pathogens, including *Listeria monocytogenes, Campylobacter jejuni, Salmonella* species, *Brucella* species, and *Escherichia coli* 0157. These infections can occur in both healthy and immunocompromised individuals, including older adults, infants, young children, and pregnant women and their unborn fetuses, in whom life-threatening infections and fetal miscarriage can occur. Efforts to limit the sale of raw milk products have met with opposition from those who are proponents of the purported health benefits of consuming raw milk products, which contain nat-

Sporadic *Salmonella* Infections

- 1.4 million nontyphoidal human *Salmonella* infections occur annually in the U.S.
- 15,000 hospitalizations
- 400 deaths
- Reptile associated salmonellosis represents 6% of salmonellosis and 11% in people < 21 years of age
- Reptile or amphibian associated Salmonellosis: 74,000 per year

Mermin et al Clin Infect Dis 2004; 38:5253-61

Table 2: Exposure or Condition Associated With Specific Pathogens Causing Diarrhea

Exposure or Condition	Pathogen(s)
Foodborne	
Foodborne outbreaks in hotels, cruise ships, resorts, restaurants, catered events	Norovirus, nontyphoidal *Salmonella*, *Clostridium perfringens*, *Bacillus cereus*, *Staphylococcus aureus*, *Campylobacter* spp, ETEC, STEC, *Listeria*, *Shigella*, *Cyclospora cayetanensis*, *Cryptosporidium* spp
Consumption of unpasteurized milk or dairy products	*Salmonella*, *Campylobacter*, *Yersinia enterocolitica*, *S. aureus* toxin, *Cryptosporidium*, and STEC. *Listeria* is infrequently associated with diarrhea, *Brucella* (goat milk cheese), *Mycobacterium bovis*, *Coxiella burnetii*
Consumption of raw or undercooked meat or poultry	STEC (beef), *C. perfringens* (beef, poultry), *Salmonella* (poultry), *Campylobacter* (poultry), *Yersinia* (pork, chitterlings), *S. aureus* (poultry), and *Trichinella* spp (pork, wild game meat)
Consumption of fruits or unpasteurized fruit juices, vegetables, leafy greens, and sprouts	STEC, nontyphoidal *Salmonella*, *Cyclospora*, *Cryptosporidium*, norovirus, hepatitis A, and *Listeria monocytogenes*
Consumption of undercooked eggs	*Salmonella*, *Shigella* (egg salad)
Consumption of raw shellfish	*Vibrio* species, norovirus, hepatitis A, *Plesiomonas*
Exposure or contact	
Swimming in or drinking untreated fresh water	*Campylobacter*, *Cryptosporidium*, *Giardia*, *Shigella*, *Salmonella*, STEC, *Plesiomonas shigelloides*
Swimming in recreational water facility with treated water	*Cryptosporidium* and other potentially waterborne pathogens when disinfectant concentrations are inadequately maintained
Healthcare, long-term care, prison exposure, or employment	Norovirus, *Clostridium difficile*, *Shigella*, *Cryptosporidium*, *Giardia*, STEC, rotavirus
Child care center attendance or employment	Rotavirus, *Cryptosporidium*, *Giardia*, *Shigella*, STEC
Recent antimicrobial therapy	*C. difficile*, multidrug-resistant *Salmonella*
Travel to resource-challenged countries	*Escherichia coli* (enteroaggregative, enterotoxigenic, enteroinvasive), *Shigella*, Typhi and nontyphoidal *Salmonella*, *Campylobacter*, *Vibrio cholerae*, *Entamoeba histolytica*, *Giardia*, *Blastocystis*, *Cyclospora*, *Cystoisospora*, *Cryptosporidium*
Exposure to house pets with diarrhea	*Campylobacter*, *Yersinia*
Exposure to pig feces in certain parts of the world	*Balantidium coli*
Contact with young poultry or reptiles	Nontyphoidal *Salmonella*
Visiting a farm or petting zoo	STEC, *Cryptosporidium*, *Campylobacter*
Exposure or condition	
Age group	Rotavirus (6–18 months of age), nontyphoidal *Salmonella* (infants from birth to 3 months of age and adults >50 years with a history of atherosclerosis), *Shigella* (1–7 years of age), *Campylobacter* (young adults)
Underlying immunocompromising condition	Nontyphoidal *Salmonella*, *Cryptosporidium*, *Campylobacter*, *Shigella*, *Yersinia*
Hemochromatosis or hemoglobinopathy	*Y. enterocolitica*, *Salmonella*
AIDS, immunosuppressive therapies	*Cryptosporidium*, *Cyclospora*, *Cystoisospora*, microsporidia, *Mycobacterium avium*–intercellulare complex, cytomegalovirus
Anal-genital, oral-anal, or digital-anal contact	*Shigella*, *Salmonella*, *Campylobacter*, *E. histolytica*, *Giardia lamblia*, *Cryptosporidium* as well as sexually transmitted infections

Abbreviations: ETEC, enterotoxigenic *Escherichia coli*; STEC, Shiga toxin–producing *Escherichia coli*.

Exposure or condition associated with pathogens

- Foodborne outbreaks
- Unpasteurized milk or dairy products
- Raw shellfish
- Raw or undercooked meat or poultry

- Swimming
- Childcare center
- Travel
- Farm or petting zoo

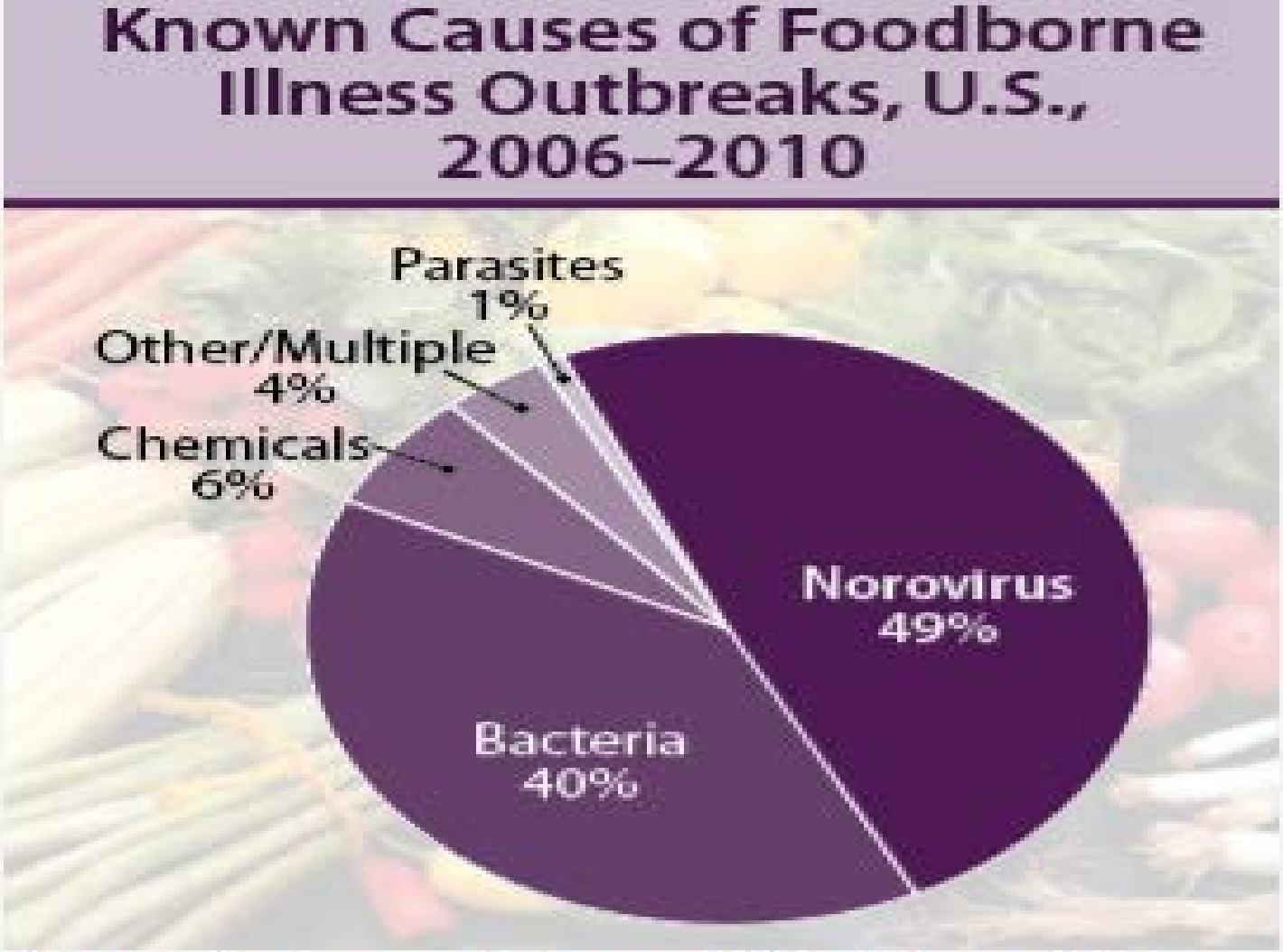

Figure 3: Known Causes of Foodborne Illness Outbreaks, U.S., 2006-2010. Norovirus 49%; Bacteria 40%; Chemicals 6%; Parasites 1%; Other/Multiple 4%.

Table 3: Clinical Presentations Suggestive of Infectious Diarrhea Etiologies

Table 3. Clinical Presentations Suggestive of Infectious Diarrhea Etiologies

Finding	Likely Pathogens
Persistent or chronic diarrhea	*Cryptosporidium* spp, *Giardia lamblia*, *Cyclospora cayetanensis*, *Cystoisospora belli*, and *Entamoeba histolytica*
Visible blood in stool	STEC, *Shigella*, *Salmonella*, *Campylobacter*, *Entamoeba histolytica*, noncholera *Vibrio* species, *Yersinia*, *Balantidium coli*, *Plesiomonas*
Fever	Not highly discriminatory—viral, bacterial, and parasitic infections can cause fever. In general, higher temperatures are suggestive of bacterial etiology or *E. histolytica*. Patients infected with STEC usually are not febrile at time of presentation
Abdominal pain	STEC, *Salmonella*, *Shigella*, *Campylobacter*, *Yersinia*, noncholera *Vibrio* species, *Clostridium difficile*
Severe abdominal pain, often grossly bloody stools (occasionally nonbloody), and minimal or no fever	STEC, *Salmonella*, *Shigella*, *Campylobacter*, and *Yersinia enterocolitica*
Persistent abdominal pain and fever	*Y. enterocolitica and Y. pseudotuberculosis*; may mimic appendicitis
Nausea and vomiting lasting ≤24 hours	Ingestion of *Staphylococcus aureus* enterotoxin or *Bacillus cereus* (short-incubation emetic syndrome)
Diarrhea and abdominal cramping lasting 1–2 days	Ingestion of *Clostridium perfringens* or *B. cereus* (long-incubation emetic syndrome)
Vomiting and nonbloody diarrhea lasting 2–3 days or less	Norovirus (low-grade fever usually present during the first 24 hours in 40% if infections)
Chronic watery diarrhea, often lasting a year or more	Brainerd diarrhea (etiologic agent has not been identified); postinfectious irritable bowel syndrome

Abbreviation: STEC, Shiga toxin–producing *Escherichia coli*.

Clinical presentations suggestive of etiologies

- Persistent or chronic: parasite
- Visible blood: STEC, shigella, campylobacter, Balantidium coli
- Severe abdominal pain: similar to above
- Fever: not highly discriminatory
- Persistent abdominal pain and fever: *Yersinia enterocolitica* and *Y. pseudotuberculosis*: may mimic appendicitis
- Vomiting and nonbloody diarrhea for 2-3 days: norovirus

Table 4: Postinfectious Manifestations Associated With Enteric Infections

Table 4. Postinfectious Manifestations Associated With Enteric Pathogens

Manifestation	Organism(s)
Erythema nodosum	*Yersinia*, *Campylobacter*, *Salmonella*, *Shigella*
Glomerulonephritis	*Shigella*, *Campylobacter*, *Yersinia*
Guillain-Barré syndrome	*Campylobacter*
Hemolytic anemia	*Campylobacter*, *Yersinia*
Hemolytic uremic syndrome	STEC, *Shigella dysenteriae* serotype 1
Immunoglobulin A nephropathy	*Campylobacter*
Reactive arthritis[a]	*Salmonella*, *Shigella*, *Campylobacter*, *Yersinia*, rarely *Giardia*, and *Cyclospora cayetanensis*
Postinfectious irritable bowel syndrome	*Campylobacter*, *Salmonella*, *Shigella*, STEC, *Giardia*
Meningitis	*Listeria*, *Salmonella* (infants ≤3 months of age are at high risk)
Intestinal perforation	*Salmonella* including *Salmonella* Typhi, *Shigella*, *Campylobacter*, *Yersinia*, *Entamoeba histolytica*
Ekiri syndrome (lethal, toxic encephalopathy) and/or seizure	*Shigella*
Aortitis, osteomyelitis, extravascular deep tissue focus	*Salmonella*, *Yersinia*

Abbreviation: STEC, Shiga toxin–producing *Escherichia coli*.

[a]Includes Reiter syndrome.

Postinfectious Manifestations

- Guillain-Barre syndrome: Campylobacter
- Hemolytic uremic syndrome: STEC, *S. dysenteriae*
- Meningitis: Listeria, Salmonella (infants < 3 months)
- Ekiri syndrome (lethal, toxic encephalopathy, seizure): Shigella
- Aortitis, osteo, deep tissue: Salmonella, Yersinia

Table 5: Laboratory Diagnostics for Organisms Associated With Infectious Diarrhea

Table 5. Laboratory Diagnostics for Organisms Associated With Infectious Diarrhea

Etiologic Agent	Diagnostic Procedures	Optimal Specimen
Clostridium difficile	NAAT	Stool
	GDH antigen with or without toxin detection followed by cytotoxin or *Clostridium difficile* toxin or toxigenic *C. difficile* strain	
Salmonella enterica, *Shigella* spp, *Campylobacter* spp	Routine stool enteric pathogen culture[a] or NAAT	Stool
Salmonella enterica serovars Typhi and Paratyphi (enteric fever)	Routine culture	Stool, blood, bone marrow, and duodenal fluid
Shiga toxin–producing *Escherichia coli*	Culture for *E. coli* O157:H7[b] and Shiga toxin immunoassay or NAAT for Shiga toxin genes	Stool
Yersinia spp, *Plesiomonas* spp, *Edwardsiella tarda*, *Staphylococcus aureus*, *E. coli* (enterotoxigenic, enteroinvasive, enteropathogenic, enteroaggregative)	Specialized stool culture or molecular assays[c] or NAAT	Stool
Clostridium perfringens	Specialized procedure for toxin detection[d]	Stool
Bacillus cereus, *S. aureus*	Specialized procedure for toxin detection[d]	Food
Clostridium botulinum	Mouse lethality assay (performed at a state public health laboratory, or CDC)[e,f,g]	Serum, stool, gastric contents, vomitus
Entamoeba histolytica; *Blastocystis hominis*[h]; *Dientamoeba fragilish*; *Balantidium coli*; *Giardia lamblia*; nematodes (generally not associated with diarrhea) including *Ascaris lumbricoides*, *Strongyloides stercoralis*[i], *Trichuris trichiura*, hookworms; cestodes (tapeworms); trematodes (flukes)	Ova and parasite examination including permanent stained smear[i] or NAAT	Stool Duodenal fluid for *Giardia* and *Strongyloides*
E. histolytica	*E. histolytica* species-specific immunoassay or NAAT	Stool
G. lamblia[i]	EIA or NAAT	Stool
Cryptosporidium spp [121][j]	Direct fluorescent immunoassay, EIA, or NAAT	Stool
Cyclospora cayetanensis, *Cystoisospora belli*[k]	Modified acid-fast stain[k] performed on concentrated specimen, ultraviolet fluorescence microscopy, or NAAT	Stool
Microsporidia (now classified as a fungus)	Modified trichrome stain[k] performed on concentrated specimen	Stool
	Histologic examination with electron microscopic confirmation	Small bowel biopsy
Calicivirus (norovirus, sapovirus)[k]; enteric adenovirus; enterovirus/parechovirus[k]; rotavirus	NAAT	Stool
Rotavirus, enteric adenovirus	EIA	Stool
Enteric adenovirus[l]; enterovirus/parechovirus	Viral culture	Stool
Cytomegalovirus	Histopathological examination	Biopsy
	Cytomegalovirus culture	Biopsy

Indications for laboratory investigation

- Epidemiologic considerations (child care center, nursing home)
- Immunocompromised host
- Extraintestinal manifestations
- Potential to impact management
- Bloody diarrhea
- Suspicion of an outbreak
- Travel
- Suspect Shiga toxin producing organism (HUS)

Laboratory diagnosis by etiologic agent

- Optimal stool specimen
- Diagnostic procedures
- Routine or specialized stool specimen
- Nucleic acid amplification test
- Toxin detection assay
- Specific immunoassay
- Microscopy
- Histology

Multiplex gastrointestinal tract panels

- Facilitate appropriate treatment
- Avoid unnecessary antimicrobial treatment
- Expedite recognition of foodborne, waterborne and other outbreaks

Culture-independent diagnostic tests (CIDTs)

- Multiplex GI panels rapidly detect a wide range of bacterial, viral and parasitic organisms
- Guide management in specific areas: child care, foodborne, nursing homes
- Facilitate public health surveillance
- Detect pathogens unsuspected by clinicians
- Reflex directed cultures may be needed for susceptibility testing

Multiplex GI Panels: Bacteria

- *Campylobacter* spp.
- C. difficile
- *Plesiomonas*
- Salmonella spp.
- *Vibrio* spp.
- EAEC, EPEC, ETEC, STEC (*E. coli* 0157)
- *Shigella*, EIEC

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- **bioMerieux Film Array**

Multiplex GI Panels: Viruses and Parasites Detected

- Viruses: Adenovirus 40/41
- Astrovirus
- Norovirus
- Rotavirus
- Sapovirus
- Parasites: Cryptosporidium
- *Cyclospora cayetanensis*
- *Entamoeba histolytica*
- *Giardia*

bioMerieux Film Array

Other diagnostic techniques to establish a diagnosis

- Fecal leukocyte and stool lactoferrin: NO
- Serologic tests: NO, but exception is post-diarrheal HUS
- White blood cell count: NO but may be useful)
- Endoscopy or proctoscopy: persistent diarrhea and AIDS, underlying medical conditions, clinical colitis and proctitis, anal intercourse,
- Duodenal aspirate for giardia, strongyloides, microsporidia, cystoisospora
- Imaging: occasionally using CT, MRI, ultrasound

Serial stool specimens

- Generally not recommended except for public health reasons and for culture dependent methods for susceptibility testing
- Public health reasons: return to child care, work, or group social activities and other areas where transmission is a consideration

Table 6: Recommended Antimicrobial Agents by Pathogen

Indication	First Choice	Alternative	Comments/Considerations
Bacteria[a]			
Campylobacter	Azithromycin	Ciprofloxacin	
Clostridium difficile	Oral vancomycin	Fidaxomicin	Fidaxomicin not currently recommended for people <18 years of age. Metronidazole is still acceptable treatment for nonsevere CDI in children and as a second-line agent for adults with nonsevere CDI (eg, who cannot obtain vancomycin or fidaxomicin at a reasonable cost).
Nontyphoidal *Salmonella enterica*[a]	Usually not indicated for uncomplicated infection	NA	Antimicrobial therapy should be considered for groups at increased risk for invasive infection: neonates (up to 3 months old), persons >50 years old with suspected atherosclerosis, persons with immunosuppression, cardiac disease (valvular or endovascular), or significant joint disease. If susceptible, treatment with ceftriaxone, ciprofloxacin, TMP-SMX, or amoxicillin.
Salmonella enterica Typhi or Paratyphi[a]	Ceftriaxone or ciprofloxacin	Ampicillin or TMP-SMX or azithromycin	
Shigella[a]	Azithromycin[f] or ciprofloxacin[g], or ceftriaxone	TMP-SMX or ampicillin if susceptible	Clinicians treating people with shigellosis for whom antibiotic treatment is indicated should avoid prescribing fluoroquinolones if the ciprofloxacin MIC is 0.12 μg/mL or higher even if the laboratory report identifies the isolate as susceptible. See https://emergency.cdc.gov/han/han00401.asp
Vibrio cholerae	Doxycycline[a]	Ciprofloxacin, azithromycin, or ceftriaxone	
Non–*Vibrio cholerae*[a]	Usually not indicated for noninvasive disease. Single-agent therapy for noninvasive disease if treated. Invasive disease: ceftriaxone plus doxycycline	Usually not indicated for noninvasive disease. Single-agent therapy for noninvasive disease if treated. Invasive disease: TMP-SMX plus an aminoglycoside	
Yersinia enterocolitica	TMP-SMX	Cefotaxime or ciprofloxacin	
Parasites			
Cryptosporidium spp	Nitazoxanide (HIV-uninfected, HIV-infected in combination with effective cART)	Effective cART: Immune reconstitution may lead to microbiologic and clinical response [154, 209, 210]	NA
Cyclospora cayetanensis	TMP-SMX	Nitazoxanide (limited data)	Patients with HIV infection may require higher doses or longer durations of TMP-SMX treatment
Giardia lamblia	• Tinidazole Note: Based on data from HIV-uninfected children • Nitazoxanide	Metronidazole Note: Based on data from HIV-uninfected children	• Tinidazole is approved in the United States for children aged ≥3 years. It is available in tablets that can be crushed. • Metronidazole has high frequency of gastrointestinal side effects. A pediatric suspension of metronidazole is not commercially available but can be compounded from tablets. Metronidazole is not FDA approved for the treatment of giardiasis.
Cystoisospora belli	TMP-SMX	Pyrimethamine Potential second-line alternatives: • Ciprofloxacin • Nitazoxanide	
Trichinella spp	Albendazole	Alternative: mebendazole	• Therapy less effective in late stage of infection, when larvae encapsulate in muscle
Fungus			
Microsporidia	For disseminated (not ocular) and intestinal infection attributed to microsporidia other than *Enterocytozoon bieneusi* or *Vittaforma corneae*: • Albendazole after initiation of cART and resolution of signs and symptoms For *E. bieneusi* or *V. corneae* infections: • Fumagillin recommended for treatment of infections due to *E. bieneusi* in HIV-infected adults	NA	Effective cART therapy: • Immune reconstitution may lead to microbiologic and clinical response • Fumagillin for systemic use is unavailable in the United States and data on dosing in children are unavailable. • Consultation with an expert is recommended.

Antimicrobial agents by pathogen

- Campylobacter: azithromycin/ciprofloxacin
- *C. difficile*: oral vancomycin/fidaxomicin
- Nontyphoidal Salmonella: none
- Typhoid or paratyphoid fever: ceftriaxone/cipro
- Shigella: azithromycin or cipro or ceftriaxone
- *Vibrio cholerae*: doxycycline/cipro or azithromycin or ceftriaxone
- *Yersinia enterocolitica*: TMX-SMX

Clin Infect Dis. 2018 Feb 1;66(4):504-511. doi: 10.1093/cid/cix844.

No Clinical Benefit of Empirical Antimicrobial Therapy for Pediatric Diarrhea in a High-Usa High-Resistance Setting.

Duong VT[1,2], Tuyen HT[1], Van Minh P[1], Campbell JI[1], Phuc HL[2], Nhu TDH[1], Tu LTP[1,3], Chau TTH[1], Nhi LTQ[1,4], Hung NT[2], Ngoc NM[5], Huong NTT[5], Thompson CN[7], Thwaites GE[1,7], de Alwis R[1,7], Baker S[1,7,8].

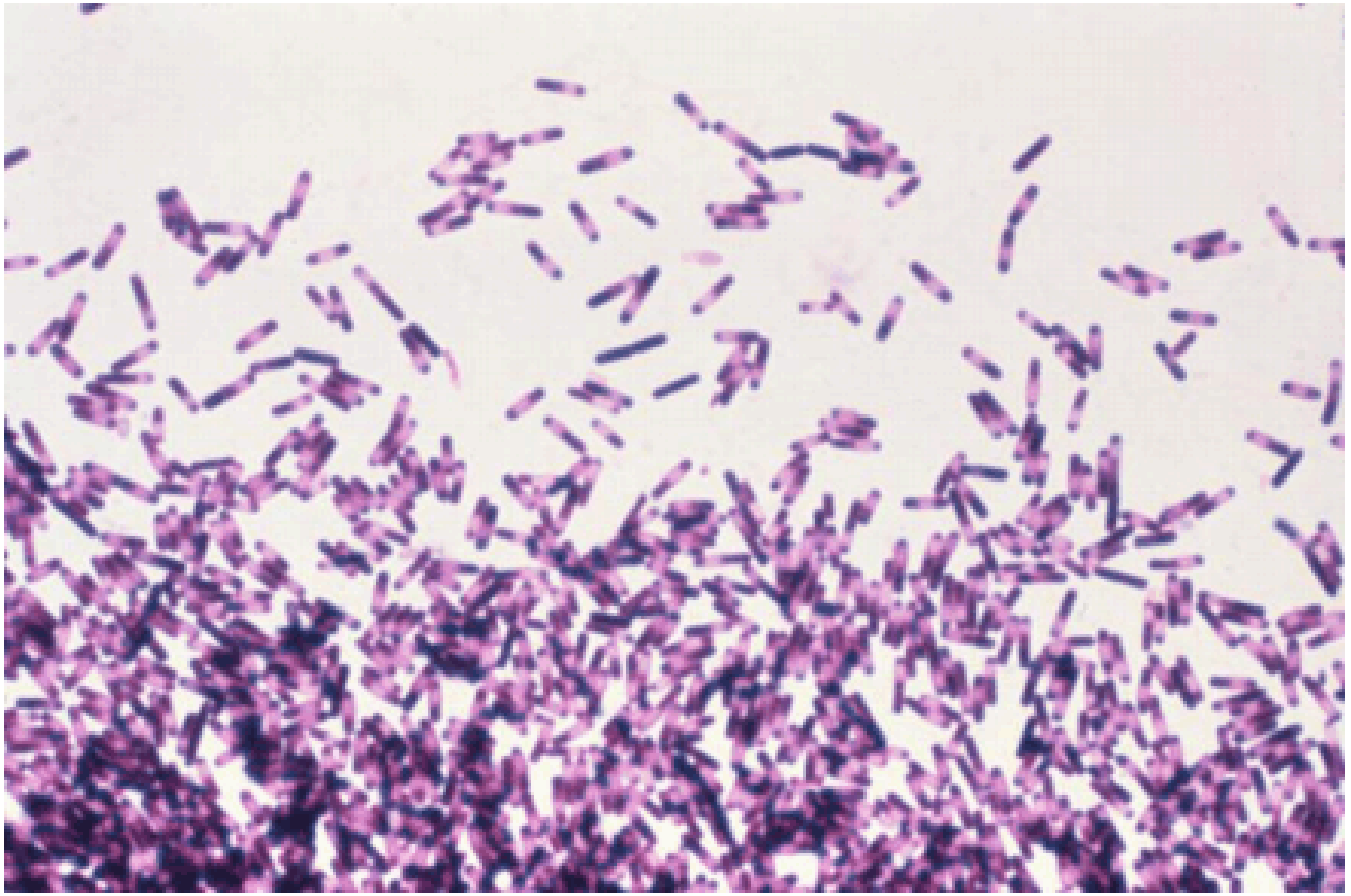
Author information

Abstract

BACKGROUND: Pediatric diarrheal disease presents a major public health burden in low- to middle-income countries. The clinical empirical antimicrobial treatment for diarrhea are unclear in settings that lack reliable diagnostics and have high antimicrobial resist (AMR).

METHODS: We conducted a prospective multicenter cross-sectional study of pediatric patients hospitalized with diarrhea containin and/or mucus in Ho Chi Minh City, Vietnam. Clinical parameters, including disease outcome and treatment, were measured. Shige nontyphoidal Salmonella (NTS), and Campylobacter were isolated from fecal samples, and their antimicrobial susceptibility profiles determined. Statistical analyses, comprising log-rank tests and accelerated failure time models, were performed to assess the effe antimicrobials on disease outcome.

Diarrheal Disease



Red Book Online Visual Library. *Clostridium difficile*

Directed management of infectious diarrhea

- Rehydration
- Human milk
- Diet
- Antimotility drugs (generally not recommended)
- Antinausea and antiemetic drugs (ocassionally)
- Probiotic preparations
- Oral zinc supplementation

Vaccines that prevent diarrhea

- Rotavirus (routine recommendation for infants)
- Typhoid (two vaccines, one oral and one injectable, are available in the U.S. but are not routinely recommended)
- Cholera (live attenuated vaccine available as a single dose oral vaccine in the U.S. for adults 18-64 years of age who travel to cholera-affected areas)
- See *https//www.cdc.gov/vaccines/hcp/acip-recs/index.html*

J Infect Dis. 2018 Jan 30;217(4):581-588. doi: 10.1093/infdis/jix589.

Trends in Rate of Seizure-Associated Hospitalizations Among Children <5 Years Old Before and After Rotavirus Vaccine Introduction in the United Sates, 2000-2013.

Pringle KD[1,2], Burke RM[1,2], Steiner CA[3], Parashar UD[1], Tate JE[1].

Author information

Abstract

BACKGROUND: Rotavirus is a common cause of acute gastroenteritis and has also been associated with generalized tonic-clonic afebrile seizures. Since rotavirus vaccine introduction, hospitalizations for treatment of acute gastroenteritis have decreased. We assess whether there has been an associated decrease in seizure-associated hospitalizations.

METHODS: We used discharge codes to abstract data on seizure hospitalizations among children <5 years old from the State Inpatient Databases of the Healthcare Cost and Utilization Project. We compared seizure hospitalization rates before and after vaccine introduction, using Poisson regression, stratifying by age and by month and year of admission. We performed a time-series analysis with negative binomial models, constructed using prevaccine data from 2000 to 2006 and controlling for admission month and year.

RESULTS: We examined 962899 seizure hospitalizations among children <5 years old during 2000-2013. Seizure rates after vaccine introduction were lower than those before vaccine introduction by 1%-8%, and rate ratios decreased over time. Time-series analyses demonstrated a decrease in the number of seizure-coded hospitalizations in 2012 and 2013, with notable decreases in children 12-17 months and 18-23 months.

Vaccine Recommendations and Guidelines of the ACIP

ACIP Vaccine Recommendations and Guidelines

Advisory Committee on Immunization Practices (ACIP)

Vaccine-Specific ACIP Recommendations

- Anthrax
- BCG
- Cholera
- DTaP
- Hepatitis A
- Hepatitis B **UPDATED**
- Hib
- Meningococcal
- Pneumococcal
- Polio
- Rabies
- Rotavirus
- Smallpox (Vaccinia)
- Tdap/Td

Table 7: Fluid and Nutritional Management of Diarrhea

Table 7. Fluid and Nutritional Management of Diarrhea

Degree of Dehydration[a]	Rehydration Therapy	Replacement of Losses During Maintenance[c]
Mild to moderate dehydration	Infants[b] and children: ORS, 50–100 mL/kg over 3–4 hours Adolescents and adults (≥30 kg): ORS, 2–4 L	Infants and children: <10 kg body weight: 60–120 mL ORS for each diarrheal stool or vomiting episode, up to ~500 mL/day >10 kg body weight: 120–240 mL ORS for each diarrheal stool or vomiting episode; up to ~1 L/day Adolescents and adults: Ad libitum, up to ~2 L/day Replace losses as above as long as diarrhea or vomiting continues
Severe dehydration	Infants: Malnourished infants may benefit from smaller-volume, frequent boluses of 10 mL/kg body weight due to reduced capacity to increase cardiac output with larger volume resuscitation. Children, adolescents, and adults: Intravenous isotonic crystalloid boluses, per current fluid resuscitation guidelines, until pulse, perfusion, and mental status return to normal. Adjust electrolytes and administer dextrose based on chemistry values. Administer up to 20 mL/kg body weight until pulse, perfusion, and mental status return to normal.	Infants and children: <10 kg body weight: 60–120 mL ORS for each diarrheal stool or vomiting episode, up to ~500 mL/day >10 kg body weight: 120–240 mL ORS for each diarrheal stool or vomiting episode; up to ~1 L/day Adolescents and adults: Ad libitum, up to ~2 L/day Replace losses as above as long as diarrhea or vomiting continue. If unable to drink, administer either through a nasogastric tube or give 5% dextrose 0.25 normal saline solution with 20 mEq/L potassium chloride intravenously.

Adapted from Centers for Disease Control and Prevention. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. MMWR Recomm Rep 2003; 52(RR-16):1–16 and World Health Organization. The treatment of diarrhoea: a manual for physicians and other senior health workers (https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5216a1.htm).

Low-osmolarity ORS can be given to all age groups, with any cause of diarrhea. It is safe in the presence of hypernatremia as well as hyponatremia (except when edema is present). Some commercially available formulations that can be used as ORS include Pedialyte Liters (Abbott Nutrition), CeraLyte (Cero Products), and Enfalac Lytren (Mead Johnson). Popular beverages that should not be used for rehydration include apple juice, Gatorade, and commercial soft drinks.

Abbreviation: ORS, oral rehydration solution.

[a]A variety of scales are available to grade the severity of dehydration in young children but no single, standard, validated method exists. Note that signs of dehydration may be masked when a child is hypernatremic.

[b]Breastfed infants should continue nursing throughout the illness.

[c]After rehydration is complete, maintenance fluids should be resumed along with an age-appropriate normal diet offered every 3–4 hours. Children previously receiving a lactose-containing formula can tolerate the same product in most instances. Diluted formula does not appear to confer any benefit.

Prevention

- Hand hygiene
- Infection control
- Food safety practices
- Direct educational efforts
- What people with diarrhea should avoid
- Report nationally notifiable diseases
- Vaccines
  - Rotavirus (infants)
  - Typhoid (children and adults)
  - Cholera (adults)

Unusual Features of O104:H4 Strains from German

- Large percentage of case patients had HUS
- HUS occurred in adults
- Frequent development of neurologic symptoms in patients when clinical and laboratory markers of HUS were improving

So, what was the causative food?

A. Peppers
B. Tomatoes
C. Lettuce
D. Sprouts
E. Spinach

Food Safety




USDA Meat and Poultry Hotline
1-888-MPHOTLINE
(1-888-674-6854)
E-mail: mphotlinea.fsis@usda.gov
Web site: fsis.outreach@usda.gov

For People with HIV/AIDS

A need-to-know guide for those who have been diagnosed with