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Foodborne Illness in the Healthcare Setting

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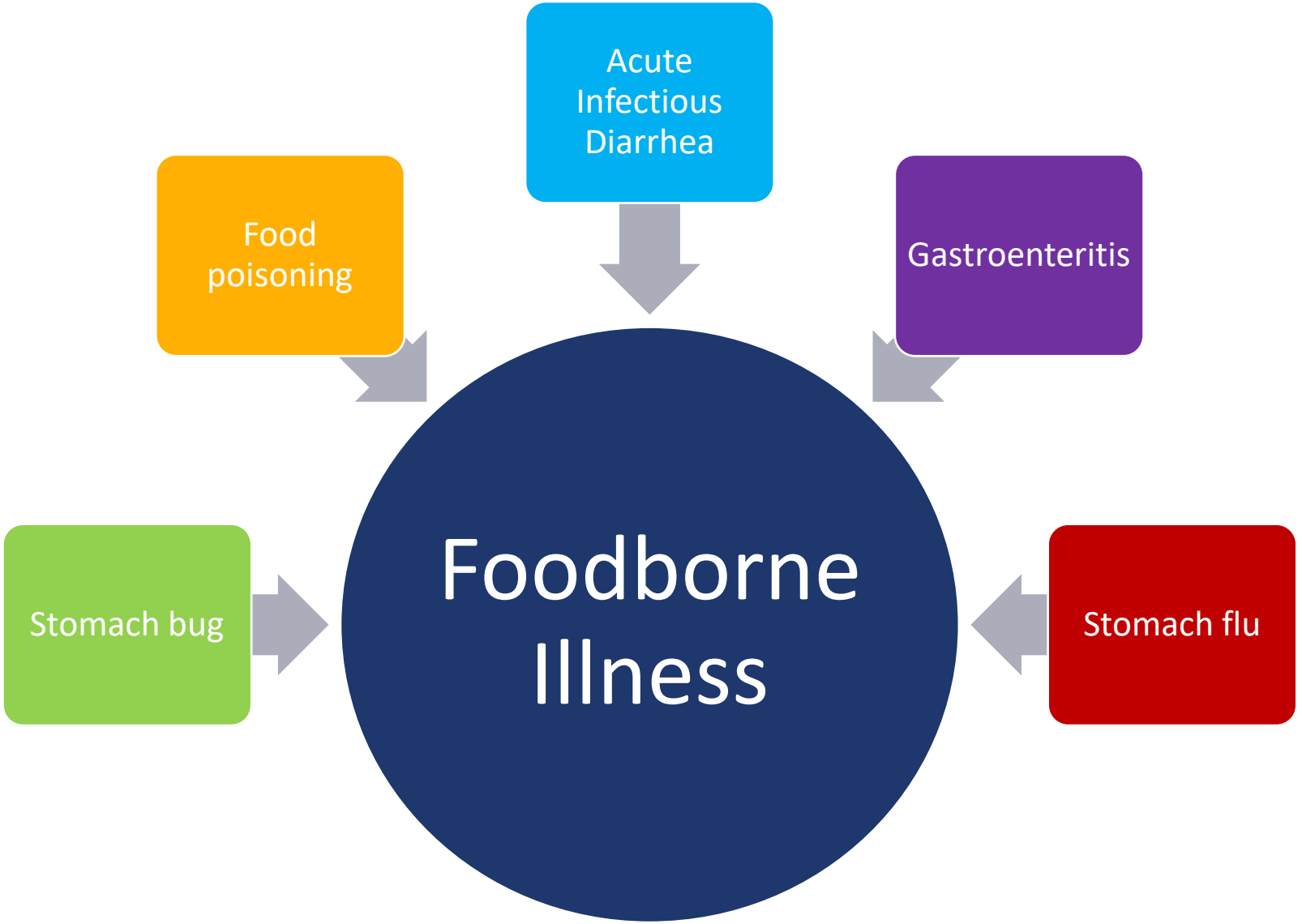
Conflicts of Interest

- Nothing to disclose



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Clinical Infectious Diseases

IDSA GUIDELINE

2017 Infectious Diseases Society of America Clinical Practice Guidelines for the Diagnosis and Management of Infectious Diarrhea

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These guidelines are intended for use by healthcare professionals who care for children and adults with suspected or confirmed infectious diarrhea. They are not intended to replace physician judgement regarding specific patients or clinical or public health situations. This document does not provide detailed recommendations on infection prevention and control aspects related to infectious diarrhea.

Keywords. diarrhea; infectious; diagnostics; management; prevention.

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Broad categories of disease

Pre-formed toxin-mediated (e.g. *S. aureus)* vs pathogen-mediated (e.g. *Salmonella)*

Vomiting predominant (e.g. *B. cereus)* versus diarrhea predominant (e.g. *Shigella)*

Non-inflammatory (e.g. Cryptosporidium) vs inflammatory diarrhea (e.g. *Campylobacter)*

Clues based on clinical presentation

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*.

Shane et al CID 2017

Clues based on exposure

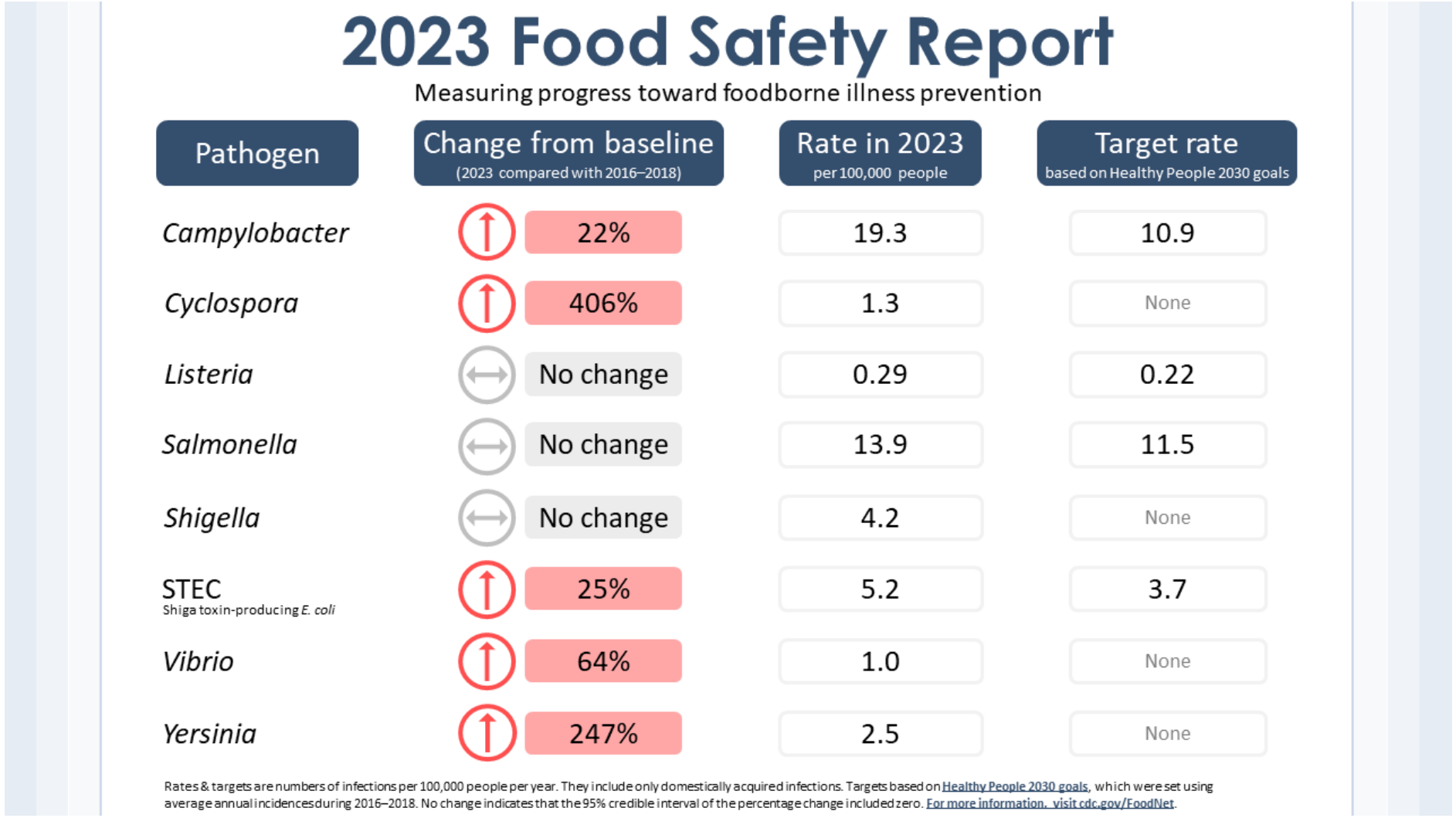
Table 2. Exposure or Condition Associated With Pathogens Causing Diarrhea

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*.

Shane et al CID 2017

Epi trends available via FoodNet



2023 Food Safety Report

Measuring progress toward foodborne illness prevention

Pathogen	Change from baseline (2023 compared with 2016–2018)	Rate in 2023 per 100,000 people	Target rate based on Healthy People 2030 goals
Campylobacter	↑ 22%	19.3	10.9
Cyclospora	↑ 406%	1.3	None
Listeria	↔ No change	0.29	0.22
Salmonella	↔ No change	13.9	11.5
Shigella	↔ No change	4.2	None
STEC Shiga toxin-producing *E. coli*	↑ 25%	5.2	3.7
Vibrio	↑ 64%	1.0	None
Yersinia	↑ 247%	2.5	None

Rates & targets are numbers of infections per 100,000 people per year. They include only domestically acquired infections. Targets based on Healthy People 2030 goals, which were set using average annual incidences during 2016–2018. No change indicates that the 95% credible interval of the percentage change included zero. For more information, visit cdc.gov/FoodNet.

https://www.cdc.gov/foodnet/reports/preliminary-data.html

Certain pathogens more likely to prompt healthcare visit

Dehydration, inability to tolerate PO

- Norovirus

Bloody diarrhea, systemic illness

- *Salmonella*, *Campylobacter*, *Shigella*
- Enterohemorrhagic/Shiga-toxin producing *E. coli* (e.g. O157:H7)

Neurologic illness

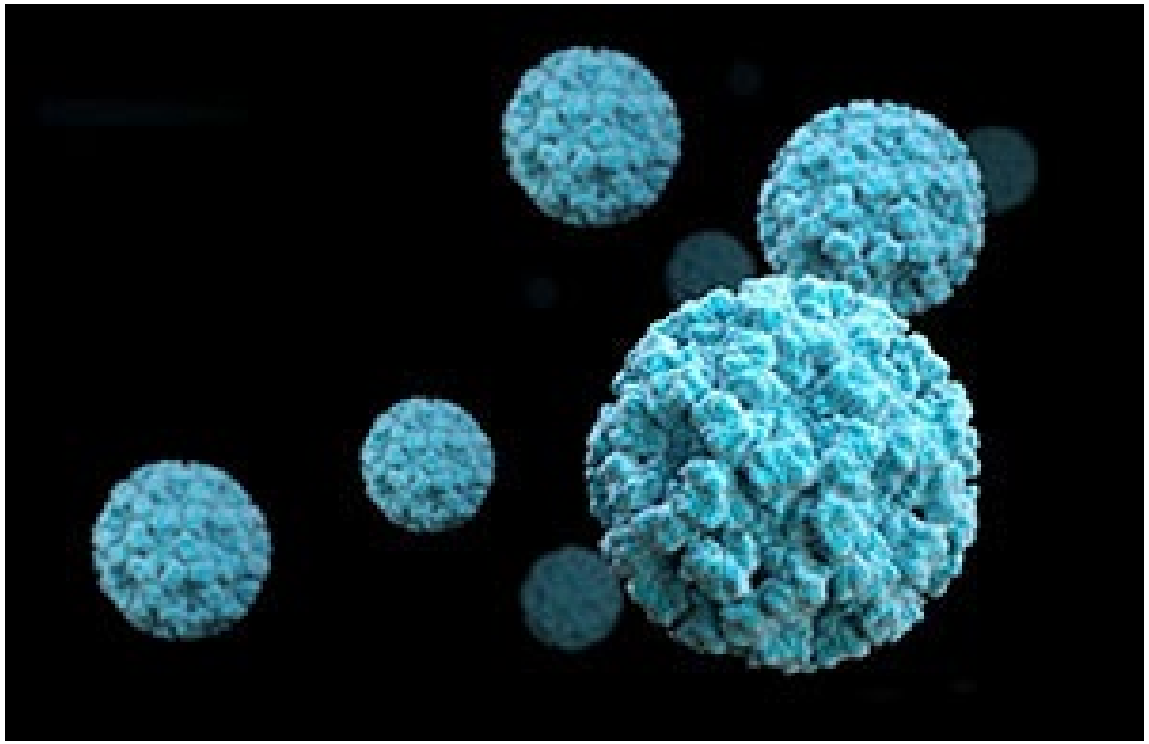
- Botulism, Ciguatera toxin, Scombroid

Prominent systemic illness

- *Listeria*
- *Vibrio vulnificus*
- Typhoidal *Salmonella*

Pathogens with outbreak potential

Norovirus



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Norovirus characteristics

- Single-stranded RNA virus in Caliciviridae family (includes Sapovirus)
  - Stable in environment → can remain viable on surfaces for 7+ days
  - Resistant to many conventional cleaning products
- Fecal-oral transmission
  - Very low viral load required for transmission
  - Direct or indirect (contaminated food/water, surfaces) contact or aerosolized particles
  - Virus shed in stool for ~4 weeks (including pre-symptomatic transmission) → longer in immunocompromised
- Seasonality: year-round, peak in winter
- Incubation period 12-48 hours
- Spectrum of clinical presentation (including asymptomatic)
  - Classic: acute-onset vomiting, cramping, watery diarrhea, +/- fever
- Incomplete immunity

Flynn Lancet 2024
Kambhamphati J Hosp Infec 2015

Norovirus characteristics that facilitate outbreaks

- Single-stranded RNA virus in Caliciviridae family (includes Sapovirus)
  - Stable in environment → can remain viable on surfaces for 7+ days
  - Resistant to many conventional cleaning products
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Flynn Lancet 2024
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Norovirus outbreaks in the healthcare setting

Table 3
Characteristics of frequent causative organisms* for outbreak investigations

	Acinetobacter spp	*Clostridium difficile*	Norovirus†	*Staphylococcus aureus*
	Number of outbreak investigations			
Type of hospital				
CAH/SRH	0	8	8	7
Community/nonteaching	14	11	19	29
Community/teaching	15	6	14	12
Major teaching or specialty	11	5	12	3
Patient care unit:				
BH/psychiatric	0	0	13	0
Medical	10	1	2	1
Medical/surgical	20	17	10	6
NICU	1	1	0	16
Rehab/LTAC	2	3	11	1
SNF	0	0	9	0
Surgical	1	4	2	20
Other‡	6	4	5	7
		Mean		
Outbreak metrics‖:				
Confirmed cases¶	6.4	11.3	12.5	5.9
Duration in days¶	48.5	84.4	17.2	56.3
Beds impacted from unit closing	6.3	—	19.6	11.8
Days unit was closed	2.5	—	9.1	10.2
		Percent		
Proportion of outbreaks‖	13.7	10.3	18.2	17.5
95% CI	(10.0-18.2)	(7.1-14.4)	(14.0-23.1)	(13.3-22.4)

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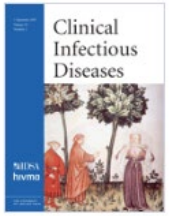
Rhinehart AJIC 2012

Norovirus outbreak in the real world

- Academic tertiary care center in Maryland Jan – May 2004
- Index cases: 2 healthcare workers in CCU
- Case definition created, active surveillance initiated
- 265 HCWs and 90 patients met case definition
  - Majority clustered in CCU, echo lab and psychiatry wards
- Shared findings: communal food, communal bathrooms, vomiting facilitating early spread
- Infection prevention measures initiated
  - Emphasis/re-education on basic IP principles
  - Visitor screening / restrictions → prohibited
  - Group meals suspended
  - Enhanced cleaning with increased frequency, addition of new surfaces, use of bleach
  - Cohorting of care teams
  - Universal contact precautions on outbreak units
  - Brief unit closure for extensive cleaning
    - Items with fabric surfaces and disposable supplies discarded
    - Intensive bleach cleaning of surfaces



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Outbreak Management and Implications of a Nosocomial Norovirus Outbreak

Cecilia P. Johnston,[1] Haoming Qiu,[7] John R. Ticehurst,[4] Conan Dickson,[6] Patricia Rosenbaum,[3] Patricia Lawson,[3] Amy B. Stokes,[3] Charles J. Lowenstein,[2] Michael Kaminsky,[5] Sara E. Cosgrove,[1,3] Kim Y. Green[7] and Trish M. Perl[1,3]

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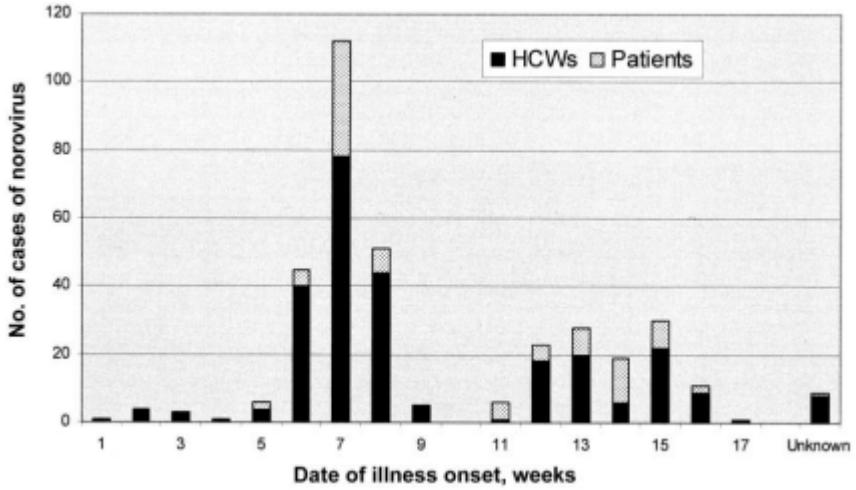

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Identify, Isolate and Inform

Identify patients presenting with acute onset GI illness

- Testing available via multiplex PCR panels

Isolate in private room (if available) with utilization of gown and gloves for ALL patient care (i.e. Contact precautions)

- Perform hand hygiene with soap and water if available
- Prioritize dedicated bathroom
- Wear surgical mask as part of Standard precautions if anticipating exposure to aerosolized particles and/or droplets
- Utilize effective cleaning products (EPA List G)

Inform infection prevention AND transferring facility if patient lives in group setting

DON'T FORGET ABOUT HEALTHCARE WORKERS!