What is norovirus?

Noroviruses (NoVs)

- Most common cause of epidemic gastroenteritis worldwide
- The leading cause of foodborne outbreaks in the United States.
  - Foods commonly involved in outbreaks—
    - Leafy greens (such as lettuce)
    - Fresh fruits
    - Shellfish (such as oysters)
- In the United States,
  - NoVs cause 19–21 million illnesses
  - Lead to 56,000–70,000 hospitalizations
  - 570–800 deaths each year.
Noroviruses

- The family Caliciviridae grouped into five genogroups (GI through GV), further divided into at least 35 genotypes.

Norovirus

- Norovirus is an extremely common cause of foodborne illness, though it is rarely diagnosed, because the laboratory test is not widely available. It causes an acute gastrointestinal illness, usually with more vomiting than diarrhea, that resolves within two days.

- Unlike many foodborne pathogens that have animal reservoirs, it is believed that Norwalk-like viruses spread primarily from one infected person to another.

Human Susceptibility

- Primarily caused by GI and GII noroviruses

- Most outbreaks caused by GII.4 strains
  - During the past decade, new GII.4 strains have emerged every 2–3 years

- GII.4 noroviruses have been associated with increased rates of hospitalizations and deaths during outbreaks
Norovirus

- It causes an acute gastrointestinal illness, usually with more vomiting than diarrhea, that resolves within two days
- The virus was first identified in 1972 after an outbreak of gastrointestinal illness in Norwalk, Ohio

Norovirus

- CDC estimates that more than 180,000 cases of Norwalk-like virus infections occur annually in the United States
- Standard hospital laboratories and commercial laboratories usually are not equipped to detect Norwalk-like viruses.
- The specialized laboratories that can detect these viruses perform tests on stool specimens from an infected person and, in some cases, can identify evidence of infection by testing blood for antibody.

Norovirus

- Leading cause of acute gastroenteritis in all age groups in the United States
- Causes 19 to 21 million cases per year
- Contributes to 56,000 - 71,000 hospitalizations and 570 – 800 deaths, mostly among young children and older adults
Norovirus

- Responsible for 58% of domestically-acquired foodborne illnesses
- Annually, it costs nearly $2 billion in the U.S. for health care and lost productivity from foodborne illness caused by norovirus

Number of U.S. Hospitalizations

Norovirus-associated deaths in the U.S.

Number of visits to a U.S. urgent care or ER

Number of visits to a U.S. medical office or clinic
Norovirus Epidemiology

• The very first instance of a Norovirus attack was reported in a town called Norwalk in Ohio, USA. In fact, the virus was initially referred to as the ‘Norwalk virus’.

• This virus belongs to the Caliciviridae virus family which causes several diseases including gastroenteritis and food poisoning.

• Most norovirus outbreaks are caused by eating food that was contaminated by a food handler.

• Can be caused by foods such as oysters, raspberries, leafy greens that were contaminated at their source

• Waterborne outbreaks also occur in communities usually due to contaminated wells and untreated recreational water
Norovirus Epidemiology

- Anyone can become infected with norovirus at any time during the year. It can be spread when someone:
  - Touches an object or surface that has been contaminated, then placing their hands in their mouth.
  - Eats or drinks contaminated food or drink.
  - It is possible to be infected with norovirus more than once in your life.

- Outbreaks in the United States are often linked to eating raw shellfish, especially oysters and clams. Shellfish become contaminated via stool from sick food handlers or from raw sewage dumped overboard by recreational and/or commercial boaters.

- Contaminated water, ice, eggs, salad ingredients, and ready-to-eat foods are other sources of infection.

- No specific treatment is available. Persons who are severely dehydrated may need rehydration therapy.

- Many oyster-related outbreaks of intestinal illness linked to Norwalk-like viruses have been reported in Louisiana, Florida, Maryland, and other states where oyster harvesting is common.
Norovirus Epidemiology

• Norovirus outbreaks occur throughout the year. But, over 80% of the outbreaks occur from November to April.

Norovirus Epidemiology

• Over 90% of diarrheal disease outbreaks on cruise ships are caused by norovirus.

• Can be especially challenging to control on cruises ships because of the close living quarters, shared dining areas, and rapid turnover of passengers.

• When the ship docks, norovirus can be brought on board in contaminated food or water or by passengers who were infected while ashore.

Norovirus Epidemiology

• Repeated outbreaks on consecutive cruises may also result from infected crew or environmental contamination.

• This is because norovirus can persist on surfaces and is resistant to many common disinfectants.
Where is norovirus likely to spread?

- Spreads quickly in closed places
  - Daycare centers
  - Nursing homes
  - Schools
  - Cruise ships

How does someone become infected?

- Eating food or drinking liquids that are contaminated with norovirus
- Touching surfaces or objects contaminated with norovirus then putting your fingers in your mouth
- Having contact with someone who is infected with norovirus (for example, caring for or sharing food or eating utensils with someone with norovirus illness).

How does an infected case transmit norovirus?

- While sick with norovirus illness
- During the first 3 days after clinical recovery from norovirus illness.
- The virus can stay in one’s stool for 2 weeks or more after clinical improvement
Incubation Period and Duration

- Incubation Period: 24 - 48 hours of being infected
- Duration: Can last for 1 - 3 days.
- NOTE: Norovirus can be found in feces even before one feels sick.

Manifestations

- Norovirus causes inflammation of the stomach or intestines or both. This is called acute gastroenteritis.
- The most common symptoms are diarrhea, nausea, vomiting, stomach pain
- Other symptoms include fever, headache, body aches

Severe Disease Manifestations

- Older adults, young children, and immunocompromised patients
- Look for symptoms of dehydration
  - Decrease in urination
  - Dry mouth and throat
  - Feeling dizzy when standing up
  - Children who are dehydrated may cry with few or no tears and be unusually sleepy or fussy.
Treatment and Recovery

• Treatment involves fluid intake by mouth or intravenous (IV)

• Although patients may feel better, they can still spread the virus to others for up to 72 hours (in some cases 1 - 2 weeks) after their symptoms have resolved.

• NOTE: No vaccine exists

Prevention

• Proper hand hygiene

• Wash fruits and vegetables

• Cook seafood thoroughly

• Do not prepare food or care for others when sick

• Clean and disinfect contaminated surfaces

• Wash laundry thoroughly

Caribbean Princess Outbreak
Cruise Statistics

- Cruise Line: Princess Cruise Lines
- Cruise Ship: Caribbean Princess
- Voyage Dates: January 25-February 1, 2014

Cruise Statistics

- Number of passengers who have reported being ill during the voyage out of total number of passengers onboard: 181 of 3102 (5.8%)
- Number of crew who have reported being ill during the voyage out of total number of crew onboard: 11 of 1148 (0.96%)
- Predominant symptoms: vomiting, diarrhea

Response

- Princess Cruise Lines and the crew aboard the ship took the following actions:
  - Increasing cleaning and disinfection procedures according to their outbreak prevention and response plan
  - Making announcements to both notify onboard passengers of the outbreak and encourage case reporting
Response

- Collecting stool specimens from ill passengers and crew for submission to the CDC lab.
- Samples tested with the vessel’s onboard rapid norovirus test were positive for norovirus.
- The specimens were sent to the CDC lab for confirmatory analysis.

Outbreak Cause: GII4.Sydney

A new strain of stomach bug was the virus responsible for almost 700 recent illnesses on a Caribbean cruise ship.

- CDC: GII.4 Sydney was the cause of the illnesses on board Royal Caribbean’s Explorer of the Seas.

The ship, carrying 3,050 passengers, docked in New Jersey after 630 passengers and 54 crew members grew ill during a Caribbean cruise.

Outbreak Cause: GII4.Sydney

- It was one of the largest norovirus outbreaks on a cruise ship in the last 20 years.
- The Sydney strain emerged within about the last two years.
  - Not considered unusually dangerous, but has quickly become a common cause of cases of vomiting and diarrhea that last a few days.
GII.4 Sydney

- Emerged in late 2012 and quickly became the predominant strain causing outbreaks not only on cruise ships but also in land-based outbreaks
- First discovered in Australia in March 2012 and has quickly circled the globe

GII.4 Sydney

- It emerged because, like the virus that causes the flu, norovirus mutates quickly, resulting in new strains every few years.
- When that happens, people who have already had previous versions of the bug can get sick again.

GII.4 Sydney has caused acute gastroenteritis outbreaks in multiple countries

- United Kingdom
- New Zealand,
- Japan,
- Western Europe, and
- Canada
- In the United States, GII.4 Sydney has spread rapidly nationwide, causing an increasing number of outbreaks.
  - During September—December 2012, a total of 141 (53%) of the 266 norovirus outbreaks reported to CalicINet were caused by GII.4 Sydney.
GII.4 Sydney Outbreaks

- Most (72 [51%]): direct person-to-person transmission;
- 29 (20%): foodborne
- 1 (1%): waterborne

- Transmission mode unknown in 39 (28%) of the outbreaks.
- Long-term-care facilities and restaurants were the most frequently reported settings, accounting for 91 (65%) and 18 (13%) of the GII.4 Sydney outbreaks, respectively.

Vessel Sanitation Program

- Cruise ships participating in the Vessel Sanitation Program (VSP) are required to report the total number of gastrointestinal (GI) illness cases—including zero—evaluated by the medical staff before the ship arrives at a U.S. port, when sailing from a foreign port.
- [http://www.cdc.gov/nceh/vsp/surv/gilist.htm](http://www.cdc.gov/nceh/vsp/surv/gilist.htm)
Vessel Sanitation Program

• Assists the cruise ship industry to prevent and control the introduction, transmission, and spread of gastrointestinal (GI) illnesses on cruise ships.

• Operates under the authority of the Public Health Service Act (42 U.S.C. Section 264 Quarantine and Inspection Regulations to Control Communicable Diseases).

• Part of the National Center for Environmental Health’s Division of Emergency and Environmental Health Services.

Why cruise ships?

• Close living quarters
• Shared dining areas
• Rapid turnover of passengers

• When the ship docks, norovirus can be brought on board in contaminated food or water or by passengers who were infected while ashore.

Why cruise ships?

• Repeated outbreaks on consecutive cruises may also result from infected crew or environmental contamination.

• This is because norovirus can persist on surfaces and is resistant to many common disinfectants.
Cruising Tips

• Wash your hands often!
  • Before
    • eating,
    • drinking, and
    • smoking.
  • After
    • touching your face,
    • going to the bathroom.
    • When your hands are dirty.
• Leave the area if you see someone get sick (vomiting or diarrhea).
• Report it to cruise staff.

Drinking water helps prevent dehydration.

• Be considerate of other people’s health.
  • If you’re sick before taking a cruise, call the cruise line to find out if there are alternative cruising options.
  • If you’re sick during a cruise, report your illness to the crew and stay in your room until your symptoms are gone.

What should I do if I become ill with diarrhea or vomiting during a cruise?

• If you become ill during a cruise, visit the ship’s medical center and follow the instructions of the medical staff aboard the ship.
• Be considerate of others, and wash your hands more frequently.

What additional measures are ships asked to take when an increased number of passengers or crew become ill?

• Ships may be advised by CDC to do the following:
• Implement additional disinfection measures and cleaning procedures.
• Advise passengers and crew who are ill to stay in their cabins until they are well for 24 hours after their last episode of diarrhea or vomiting.
What additional measures are ships asked to take when an increased number of passengers or crew become ill?

- Report numbers of cases of illness to CDC on a daily basis.
- Discontinue certain high-risk activities or activities during a cruise.

Where can I find more information about a past voyage?

- The VSP website lists voyages during which the percentage of sick passengers or crew who reported their illness was over 3%.
- The website also lists additional outbreak prevention and control strategies conducted by the cruise line.
- You can find more information about the voyage at http://www.cdc.gov/nceh/vsp/surv/GIlist.htm.

Not all cruise ships

- The ship may not be in the inspection database because it does not meet the criteria for inspection.
- It might not have
  - A foreign itinerary,
  - A U.S. port, or
  - More than 13 passengers.
**Goals**

- Health-care providers and public health practitioners should remain vigilant to the potential for increased norovirus activity in the ongoing season related to the emergent GII.4 Sydney strain.
- Continued surveillance for norovirus outbreaks through CaliciNet

**Goals**

- Additional data on clinical and epidemiologic features of outbreaks collected through the National Outbreak Reporting System (NORS) will enable further assessment of the public health implications of the new GII.4 Sydney strain.
- This includes any association with increased severity or level of activity in the ongoing 2012–13 winter norovirus season.

**Keys to Norovirus Prevention and Control**

- Proper hand hygiene,
  - Soap & water
  - After changing diapers
  - After using toilet
  - Before eating food
- Rinse fresh fruit & vegetables before eating
- Cook shellfish thoroughly
- Disinfect surfaces with bleach-based cleanser
- Environmental disinfection,
- Isolation of ill persons
  - Don’t mingle 2-3 days after recovery
Help Prevent the Spread of Norovirus ("Stomach Bug")

1. Clean up surfaces:
   - Wash thoroughly with soap and water.
   - Use a bleach solution.
2. Disinfect surfaces:
   - Proprietary products certified for hard surface disinfection.
3. Wash your hands thoroughly with soap and water.

Norovirus Links

- http://www.cdc.gov/media/releases/2014/a0130-norovirus.html

CDC Public Response Hotline

- 1-800-CDC-INFO (1-800-232-4636)
References


