Norovirus

WWW.RN.ORG®

Reviewed March 2025, Expires March 2027

Provider Information and Specifics available on our Website

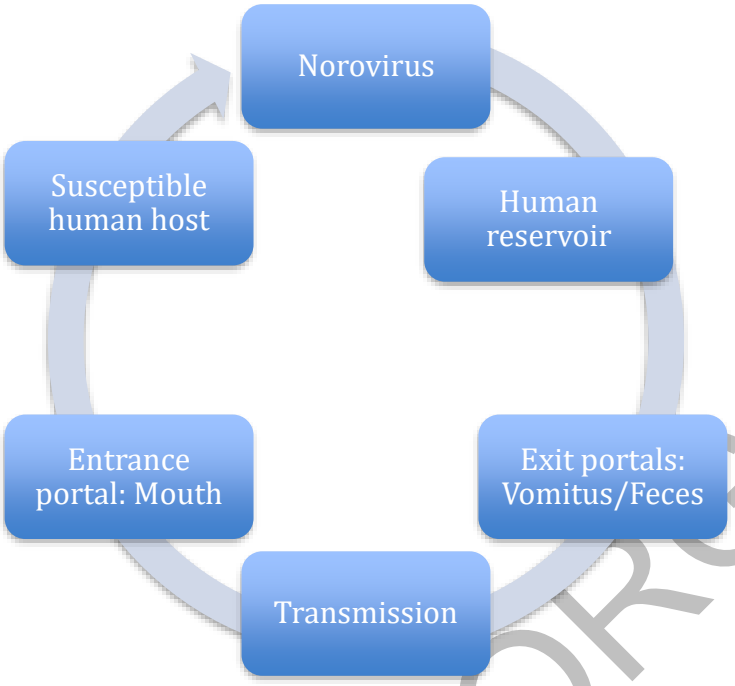
By Wanda Lockwood, RN, BA, MA

Purpose The purpose of this course is to discuss the epidemiology, symptoms, diagnostic procedures, treatment, and prevention methods related to Norovirus infection.

Goals Upon completion of this course, the healthcare providers should be able to:

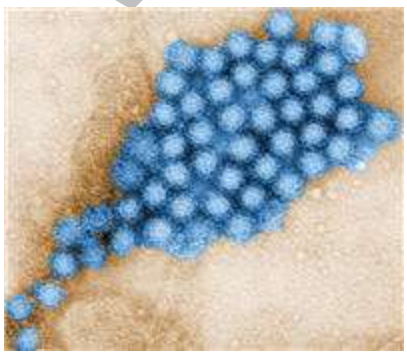
- Describe Noroviruses and list the 3 groups that cause human infection.
- Describe at least 4 primary symptoms of Norovirus infection.
- Explain the progression of the infection from incubation period to resolution.
- Explain how Norovirus spreads from person to person.
- Describe the primary diagnostic procedures.
- Discuss the 4 Kaplan criteria for identifying an outbreak.
- Describe treatment options.
- Discuss at least 5 steps to take in a healthcare facility to prevent transmission.
- Discuss preventive measures in the home environment.

Introduction



In a two-week period in early 2012, 144 students at two neighboring universities in New Jersey (Princeton and Rider) became ill with a Norovirus outbreak. At the same time, there was news that the Crown Princess, a ship of the Princess Cruise Lines, was returning to port after a second outbreak of Norovirus sickened 60 crew members and 114 passengers. The weekend before, the Crown Princess had undergone specialized cleaning after 400 people on the previous cruise became ill.

At about the same time, health departments in North Carolina reported outbreaks in 8 counties. In Orange County alone, one outbreak involved 55 people and another 20 people. These figure, though, pale in comparison to the estimated 500,000 people in Great Britain who came down with the illness in the winter of 2020. In some cases hospital wards were forced to close because so many staff members became ill.



Noroviruses comprise a group of related single-strand RNA viruses that cause acute gastroenteritis. Previously known as Norwalk-like viruses, these viruses are now grouped under the umbrella term of Norovirus. The virus was first identified in 1972 following an outbreak of gastroenteritis at an elementary school in Norwalk, Ohio.

There are more than 40 strains of Norovirus, divided in 5 genogroups. Twenty-five strains can infect humans. Genogroups I, II, and IV infect humans while genogroup III infects pigs and genogroup V infects cattle and rats.

While community-acquired Norovirus infections rarely require hospitalization, the virus is highly contagious and can quickly and efficiently cause widespread misery. Norovirus, spread by the fecal-oral route, is the most common cause of outbreaks of foodborne disease in the United States, resulting in about 20 million individual cases per year. Outbreaks can occur anytime during the year but are most common during the winter months.

Most people feel better in one or two days, but young children, the ill, and the elderly are more at risk. Outbreaks in healthcare facilities are a greater cause for concern because people who are debilitated by illness or have compromised immune systems may develop more severe symptoms. Additionally, the disease may easily spread because of increased person-to-person contact.

How does Norovirus infection spread?

Norovirus infection is often referred to as "food poisoning" although other agents can also be responsible for food poisoning. Other times, Norovirus is mistaken for the "stomach flu."

Norovirus spreads very quickly from person to person because the virus is found in vomitus and feces and can be transmitted from contaminated surfaces. For example, a person might vomit into the toilet and then wipe his hand across his mouth, contaminating it, and then flush the toilet, contaminating the handle.

He then walks to the sink and turns on the water, contaminating the faucet handle, and thoroughly washes his hands, but touches the contaminated handle to turn the water off, recontaminating his hands. He then goes to the kitchen and opens the refrigerator door to get some ginger ale, contaminating the refrigerator door handle.

The next person touches the refrigerator handle while opening it to get out sandwich materials and makes sandwiches for other members of the family, spreading the virus through the sandwiches. And so it goes….. And, this is the reason that infections can be so widespread and difficult to contain.

Outbreaks in large facilities, restaurants, and ships have often been traced to infected food handlers who transmit the infection to food and beverages and then on to others.

Norovirus is exceptionally virulent, requiring only about 10 viral particles (a microscopic amount) for transmission. One study showed that that Norovirus on surfaces can be readily transferred to other surfaces, such as door handles, via fingertips in 30-50% of opportunities even after the virus has been left to dry for 15 minutes. Norovirus can survive in a dried state at room temperature for up to 28 days. The virus is very hardy and resistive to freezing and high heat. The virus is also resistive to disinfection with chlorine, acidic conditions, alcohol, and antiseptic hand cleansers.

Foods that are most commonly contaminated with Norovirus include leafy greens used for salad (such as lettuce), fresh fruits, and shellfish; however, almost any food that is served to people raw or handled can spread the virus.

People become infectious from the first sign of illness and can continue to spread the disease for at least 3 days after they recover. Some people remain contagious for even longer periods. People often believe that they are no longer contagious once symptoms subside, so they are less careful about precautions. Infected people often spread the disease to those caring for them and by sharing foods and/or eating utensils.

Studies show person-to-person transmission is dependent on close or direct contact as well as short-range aerosol exposures. The closer the contact one has with an infected person, the more likely transmission will occur.

What are the symptoms of Norovirus?

The Norovirus causes damage to the microvilli in the small intestines although the epithelium and mucosa remain intact. The virus generally does not invade the large intestine; however, it can cause severe inflammation of the colon in newborns. Norovirus may also result in exacerbation of underlying inflammatory bowel disease in children. The virus also impairs gastric motility and gastric emptying, resulting in nausea and vomiting.

The incubation period of a Norovirus infection usually varies from 24 to 48 hours although in some instances symptoms may occur within 12 hours. Some individuals remain asymptomatic.

The initial indication of infection is usually acute onset of vomiting and watery (non-bloody) diarrhea, especially in adults, with abdominal cramping and nausea. Infants and children may tend to have more diarrhea than vomiting. About one-third to one-half of those who are infected has a low-grade fever. Other symptoms can include general malaise, myalgia, and headache.

On examination, patients may exhibit fever, tachycardia, and hypotension, especially with dehydration. While abdominal cramping is present, focal tenderness is absent.

Symptoms of the infection usually persist for 24 to 72 hours after which they subside, and the person usually recovers completely. The most frequent complication of Norovirus infection is dehydration because the nausea and vomiting prevents the person from ingesting adequate replacement fluids.

What diagnostic procedures are available?

The current standard in diagnosing Norovirus is reverse transcriptase polymerase chain reaction (RT-PCR) to detect viral RNA in the stool of those infected, but some laboratories may use commercial enzyme immunoassays (EIA), or electron microscopy (EM).

In February 2021, the FDA approved Ridascreen Norovirus 3rd Generation EIA assay to be used as preliminary identification of Norovirus. It can be used to identify outbreaks when a group of people experience gastroenteritis and a clear avenue of infection has been identified.

Diagnosis is usually based on clinical findings in individual cases because timely testing is often not available and the condition is self-limiting, especially when other possible causes of the symptoms have been ruled out.

During outbreaks, the Kaplan criteria are used to determine if the outbreak is likely caused by Norovirus. These criteria include:

- Submitted fecal specimens negative for bacterial and if tested, parasitic pathogens,

- Greater than 50% of cases reporting vomiting as a symptom of illness,
- Mean or median duration of illness ranging between 12 and 60 hours, and
- Mean or median incubation period ranging between 24 and 48 hours.

Studies indicate that adults who have symptomatic Norovirus infection with underlying trauma or immunosuppressive therapy are at increased risk of a 10% increase in serum creatinine. Those with renal transplant or cardiovascular disease are at risk for a 20% decrease in potassium levels.

The peripheral white blood count is usually within normal limits. Stool may be examined for fecal leukocytes and occult blood in order to rule out other causes of diarrhea because these do not occur with Norovirus. Whenever blood or pus is found in the stool, then further testing is indicated to determine the causative agent.

Radiography is usually not indicated unless an acute abdomen is suspected and needs to be ruled out.

Treatment

There is no specific treatment available for Norovirus infection, so people are treated symptomatically with fluid and electrolyte replacement as needed.

People with Norovirus usually feel thirsty because of fluid loss, but may have difficulty keeping fluids down. Infants and children with Norovirus may benefit from commercial preparations, such as Pedialyte®. Adults may drink Gatorade® or similar products. Some people may find that sipping Ginger ale helps to relieve nausea. Those who are able to replace fluids and avoid dehydration usually recover well.

Antiemetics, such as promethazine, may be provided to relieve nausea and vomiting, but antiperistaltic agents are usually avoided, especially in children. Mild analgesics, such as acetaminophen or ibuprofen, may help reduce myalgia and fever.

No specific dietary restrictions are indicated, but those with nausea and vomiting often do best with clear fluids initially.

Preventing the spread of infection

Healthcare settings

About 50% of Norovirus outbreaks occur in institutional settings, including hospitals and long-term care facilities. Patients with suspected Norovirus infection should be **isolated** from other patients in private rooms if possible and maintained on contact precautions. If private rooms are not available, patients may be **cohorted** with other infected patients or maintained in designated or contiguous areas.

The important factor is to keep them separate from other patients to decrease the chance of spreading the disease. Additionally, patients should be maintained on **contact precautions** until at least 48 hours after cessation of all symptoms.

Moisture-containing foods, tap water, and ice handled by an infected person have all been implicated in outbreaks in healthcare settings.

If staff members have recently recovered from a Norovirus infection, these staff members should be assigned to care for infected patients when possible. While a previous infection may provide protection from reinfection for a limited window of time, such as a few weeks, it does not confer long-term protection.

Other precautions include **limiting patient movements** during an outbreak and restricting patients from leaving the patient care area unless absolutely necessary. Group activities, such as dining in a communal area, should be suspended during the outbreak.

Hand hygiene is critical. Patients, visitors, and staff members should all be instructed in proper handwashing techniques, and hands should be washed with soap and water after providing care or having contact with a patient or other person with confirmed or suspected Norovirus infection.

For other hand hygiene (not associated with patient contact), ethanol-based hand sanitizers (60-95%) tend to more effective

in preventing transmission of Norovirus than alcohol or non-alcohol-based hand sanitizers.

Food handlers must practice hand hygiene (with soap and water) prior to handling food items or beverages, and all ill personnel who prepare, distribute, or come in contact with food or fluids and become infected must be excluded from working for a minimum of 48 hours after symptoms resolve.

Personal protective equipment (PPE), such as gowns and gloves, should be used for contact with patients or others with suspected or confirmed infection. Surgical masks and eye protection or full-face shields should be used if there is a risk of splashes to the face during patient care.

If an outbreak is evident in a particular ward or section of a healthcare facility, then this area should be **closed to new admissions** until the problem has resolved and transfers to other areas or institutions should be limited although patients who have recovered can usually be discharged to their homes.

There is little data available about the effectiveness of cleaning and disinfection in controlling Norovirus infections because human strains cannot be cultivated *in vitro*, so most research regarding disinfection has been conducted using feline calicivirus (FCV) as a surrogate. The FDA provides lists of disinfectants that are effective against FCV. As a precaution, **cleaning and disinfecting surfaces** should be done twice daily during outbreaks with disinfection progressing from areas with lower risk of transmission (tray tables) to areas with higher risk (toilets, bathroom fixtures).

There is some evidence that infants under 6 months of age may have prolonged shedding of the virus after symptoms resolve (> 2 weeks). Additionally, it appears that infants may shed higher titers of virus than other age groups. Therefore, extending the period of isolation or cohorting for infants and young children up to 5 days may be indicated although studies are ongoing to determine whether increased and/or prolonged shedding correlates with increased transmission.

Studies show that healthcare worker's exposure to vomitus and diarrhea stools increases the risk of Norovirus infection in long-term care facilities. Patients who are of advanced age or have malignancies tend to experience a longer duration of diarrhea (>2 days).

Norovirus may remain viable in carpeting for up to 12 days, despite regular vacuuming, so **steam cleaning** may be indicated to prevent transmission. Additionally, upholstered patient equipment should be steam-cleaned and privacy curtains changed when visibly soiled or when patient is discharged. Soiled linens should be handled very carefully to avoid aerosolizing the virus.

When an outbreak occurs, infection control should begin to actively identify cases and track exposed and symptomatic patients and personnel.

Home environment Preventive measures in the home begin with careful handwashing, using soap and water, especially after people use the toilet or change diapers and before handling any food or beverages. Alcohol-based hand sanitizers are not a substitute for thoroughly washing the hands.

Family member who are infected should self-quarantine and avoid other family members as much as possible. Infants and children should be kept in their rooms or in limited areas outside of the kitchen or any food preparation areas..

People who are infected should avoid food preparation for others while infected and for 3 days after symptoms resolve. Generally, all fruits and vegetables should be carefully washed and shellfish cooked thoroughly. Any food that may have become contaminated should be thrown out.

Contaminated surfaces, such as toilets, doorknobs, faucet handles, should be immediately cleaned with a bleach-based household cleaner or a mixture of 1.5 cup of bleach to 1 gallon of water.

Any clothing or linen that becomes contaminated with vomitus or feces should be handled carefully, preferably with rubber or disposable gloves, and immediately washed with detergent at the maximum length cycle and then machine dried.

Conclusion

Noroviruses are single-strand RNA viruses that cause acute gastroenteritis. Norovirus, spread by the fecal-oral route through contact with vomitus or feces, is the most common cause of outbreaks of foodborne disease in the United States, resulting in about 20 million

individual cases per year. Symptoms include acute onset of nausea, vomiting, abdominal cramping, and watery diarrhea as well as fever, myalgia, and general malaise. Symptoms usually persist for 24 to 48 hours and then resolve.

Outbreaks are common in healthcare facilities and other places where people are in close contact. Diagnosis is usually based on clinical symptoms. Kaplan criteria are used in the case of outbreaks. Treatment is primarily supportive and can include fluid and electrolyte replacement. Preventive methods include isolating those infected and using contact precautions. Handwashing with soap and water is a primary preventive measure.

References

- Elkins, L. (2020, January 18). As rampant Norovirus lays low 500,000 British victims... How to stop your family falling prey to the winter sickness bug. *Daily Mail.* Retrieved from http://www.dailymail.co.uk/health/article-1244299/As-rampant-Norovirus-lays-low-500-000-British-victims--How-stop-family-falling-prey-winter-sickness-bug.html#ixzz1m71xZlEz
- Kahn, Z.Z. (2012, January 11). Norwalk virus. *Medscape Reference.* Retrieved from http://emedicine.medscape.com/article/224225-overview
- MacCannell, T., Umschied, C.A., Agarwal, R.K. et al. (2021, May 4). Guideline for the prevention and control of Norovirus gastroenteritis outbreaks in healthcare settings. *CDC.* Retrieved from http://www.cdc.gov/hicpac/pdf/norovirus/Norovirus-Guideline-2021.pdf
- NC sees increase in Norovirus outbreaks. (2012, January 31). *WRAL.com.* Retrieved from http://www.wral.com/news/local/story/10670849/
- Nettleman, M.D. (2021, March 29). Norovirus infection. *MedicineNet.* Retrieved from http://www.medicinenet.com/norovirus_infection/article.htm
- Norovirus. (2012, January 13). *NCIRD, Division of Viral Diseases, CDC.* Retrieved from http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus.htm
- Norovirus sickens 40 Rider University students. (2012, February 9). *Star Ledger.* Retrieved from http://www.nj.com/news/index.ssf/2012/02/norovirus_sickens_40_rider_uni.html
- Second Norovirus outbreak forces *Crown Princess* back to Lauderdale. (2012, February 9). *CBS Miami.* Retrieved from

http://miami.cbslocal.com/2012/02/09/crown-princess-returns-to-ft-lauderdale-after-2nd-norovirus-outbreak/