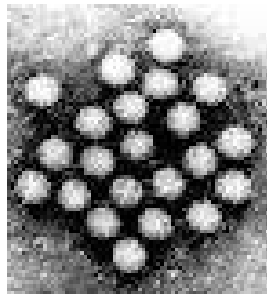


CONTAGIOUS COMMENTS

Department of Epidemiology

The Story of an Outbreak *Norovirus*



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The Outbreak

One October morning, a call came to the Department of Epidemiology regarding a cluster of patients and staff in the Gary Pavilion behavioral units whom all had similar gastroenteritis symptoms. The nurse epidemiologist launched an investigation. Overall, 118 individuals (patients, family members and staff) became ill during the course of the outbreak from September 21, 2011-October 28, 2011. Five of these individuals required hospitalization for dehydration. Stool samples collected from outbreak cases identified Norovirus as the causative agent.

Recently Tri-County Health Department sent out a bulletin alerting area hospitals and long term care facilities to an increased number of outbreaks within facilities this winter ([See attached Health Advisory](#)).

What is Norovirus?

Norovirus (also known as Norwalk-like virus, NoV) is a small, round, nonenveloped virion with a single, positive-stranded RNA genome. NoVs are members of the Caliciviridae family, and have a high degree of genetic diversity. Noroviruses are classified into five genogroups (GI – GV) based upon the phylogenetic analysis of the viral capsid (VP1) gene and further subdivided into genetic clusters called genotypes. NoVs are the leading cause of epidemic and sporadic cases of gastroenteritis worldwide. Point mutations and recombination of related NoVs contribute to the great diversity of NoVs. Similar to influenza A, new antigenic variants of NoVs can arise resulting in epidemics. Since 1995, there have been five known epidemic variants of NoV which have spread around the world. All of these epidemics have been associated with a single genotype, GII.4. Outbreaks of NoV often occur in semi-closed environments and at recreational activities that favor person-to-person spread. Outbreaks have been linked to several different settings including daycare centers, camps, schools, cruise ships and hospitals.

Clinical Features

The most common clinical features are a sudden onset of diarrhea, vomiting, nausea and abdominal cramps. Diarrheal stools usually contain no blood, mucus, or leukocytes. Vomiting is more common in children and diarrhea is more common in adults. Some people may only experience vomiting or diarrhea rather than both. (Of our 118 cases, approx 1/3 had both) Fever occurs in 35 – 45% of cases and muscle cramps are sometimes seen. Symptoms generally appear after a short incubation period, generally 12-48 hours after exposure. In 80% of patients, symptoms usually last 1-3 days. Illness can last longer, up to 4-6 days, in children younger than 11 years of age. The overall severity of illness is less than other diarrheal infections, but it can lead to dehydration and hospitalization especially in children under 5 years of age, adults older than 65 years of age, and in immunocompromised individuals. It is estimated that asymptomatic infections occur in approximately 1/3 of those who are infected.

Diagnosis

Reverse-transcription polymerase chain reaction (RT-PCR) of diarrheal stools or emesis for NoVs is the diagnostic modality of choice. The development of sensitive and specific RT-PCR assays for NoVs has been difficult due to the genetic diversity of these viruses. The majority of clinical laboratories do not offer RT-PCR testing for NoVs, and subsequently most testing is done by public health reference laboratories or in a research setting. Norovirus PCR testing is done at the Colorado Department of Public Health and Environment laboratories for outbreak investigations but test submission requires approval by Epidemiology. Electron microscopy, available at Children's, can be used to identify NoVs, but it is relatively insensitive compared to RT-PCR assays.

Treatment

Treatment is primarily supportive therapy to prevent and treat dehydration. In a subset of patients, hospitalization may be required for IV hydration. No specific antiviral therapy is available.

Transmission

NoVs are primarily shed in the stool but virus may be aerosolized via the vomitus of infected persons. This virus is extremely contagious due to its low infectious dose (18 to 1,000 viral particles), short incubation period, stability on environmental surfaces, and resistance to conventional cleaning agents. Humans are the only known reservoir. Transmission occurs either from person to person through the fecal-oral route (via contaminated hands) or by ingestion of aerosolized vomitus, through contaminated food or water, or by indirect exposure to contaminated environmental services.

Disinfection and Infection Control

NoVs can survive high levels of chlorine, low pH, and varying temperatures making the ability to eradicate them from the environment challenging. Since NoVs can survive in the environment, in an outbreak setting it is critical to tackle contaminated environmental surfaces to disrupt the spread. The use of 1:10 chlorine bleach solutions have been well documented as being effective in the disinfection process. The CDC recommends standard precautions with a strong emphasis on adequate hand hygiene for suspected NoV cases. Contact precautions, with gowns and gloves, are recommended when contact with incontinent persons is required, in outbreak settings, and when there is contact with potentially infected feces or vomitus.

Prevention

Norovirus infections occur year round, although outbreaks tend to peak in cold weather. Viral shedding tends to peak at 1-3 days after the onset of illness, but shedding for as long as 8 weeks has been documented in healthy individuals. Adherence to hand

hygiene on a regular basis, good environmental cleaning, and staying home when ill are essential components to preventing the spread of NoVs. There is no long lasting immunity to norovirus and persons may become infected more than once in their lifetime. Due to the high prevalence of NoV infections, there has been interest in development of a vaccine. Recently, in a small, randomized, double-blind placebo controlled trial, an intranasally administered norovirus virus like particle vaccine was shown to be protective against illness and infection after challenge with a homologous NoV in healthy adults. Although, these results are exciting and promising, several challenges still need to be addressed for the future success of a NoV vaccine including determination of duration of protection following vaccination, determination of vaccine efficacy in a natural setting and in high risk populations, and coverage of antigenically and genetically diverse groups of viruses.

More information can be found at: <http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm>

References

1. Atmar RL, Bernstein DI, Harro CD, Al-brahim MS, Chen WH, Ferreira J, Estes MK, Graham DY, Opekun AR, Richardson C, Mendelman PM. Norovirus Vaccine Against Experimental Human Norwalk Virus Illness. *N Engl J Med.* 2011;365:2178-87.
2. Bull RA, White, PA. Mechanisms of GII.4 Norovirus Evolution. *Trends in Microbiology.* 2011;19(5):233-240.
3. Glass RI, Parashar UD, Estes MK. *N Engl J Med.* 2009;361:1776-85.
4. Koo HL, Ajami N, Atmar RL, DuPoint HL. *Discov Med.* 2010;10(50):61-70.



Health Advisory

Increase in Norovirus Outbreaks in Health Care Facilities

January 2012

In the last few weeks, Tri-County Health Department (TCHD) has seen a large increase in outbreaks of viral gastroenteritis in long-term care facilities (LTCFs) and hospitals. The majority of these outbreaks are being caused by noroviruses.

These viruses are highly contagious and spread easily and rapidly in health care facilities, often leading to protracted outbreaks. This report offers some guidelines to help prevent or limit the spread of noroviruses in your health care facility.

About Norovirus:

Norovirus outbreaks can occur at any time of the year, but are more common in the winter and early spring. Noroviruses are highly concentrated in the stool and vomitus of infected people. The viruses have a low infectious dose, which allows for easy person-to-person transmission via the *fecal-oral* route. *Airborne transmission through aerosolized vomitus* can also occur. Noroviruses can cause protracted outbreaks in hospitals and LTCFs due to the low infectious dose, close living quarters, and potential for decreased hand hygiene among residents due to various health conditions.

Typical symptoms of norovirus infection include vomiting and non-bloody diarrhea. Other potential symptoms include low-grade fever, headache, muscle aches, nausea, abdominal cramps, chills, and malaise. The average duration of symptoms is 24-72 hours. Dehydration is the most common complication, especially among the young and elderly, and, in some cases, may require intravenous fluids. People are most contagious from the moment they begin feeling ill *until at least two days after recovery*.

Preventing Norovirus Outbreaks:

- **Receiving patients:** Prior to accepting patients from other facilities, ask if the patient has been symptomatic and *when* their last episode of vomiting and/or unexplained diarrhea occurred. Separate these incoming patients from other patients and place them on contact precautions until they have been symptom-free for at least 48 hours. Symptomatic patients who are being transferred into a facility should be reported to the person in charge of infection control.
- **Patient Management:** Patients with diarrhea and vomiting should be placed on contact precautions; they should be restricted to their rooms and kept away from non-ill patients as much as possible until at least 48 hours *after* cessation of vomiting and diarrhea.
- **Staff:** Ill staff should be excluded from work until at least 48 hours *after* diarrhea and vomiting have ceased, even if they are feeling well sooner.
- **Cleaning:** Noroviruses are very hardy and can survive relatively high levels of chlorine. To effectively disinfect areas soiled with feces or vomitus, promptly clean with a 10% solution of household chlorine bleach (a cup of bleach per nine cups of water) or an EPA-approved disinfectant with specific activity against norovirus. Quaternary ammonium compounds are not effective against noroviruses. A list of EPA-registered disinfectants is available at: www.epa.gov/oppad001/chemregindex.htm. And remember, always handle vomitus as if it contains norovirus. When someone vomits, have people clear the area, and make sure the person cleaning up the accident wears gloves and a simple face mask.

Testing:

Norovirus outbreaks can be difficult to distinguish from outbreaks of other etiologies. When an outbreak of gastrointestinal illness is detected, the Colorado Department of Public Health and Environment (CDPHE) strongly encourages facilities to submit stool for bacterial culture and norovirus testing simultaneously. This helps to rapidly identify outbreaks of other pathogens, since control measures may differ from those used for norovirus.

Reporting Requirements:

An isolated, individual case of norovirus infection is not a reportable condition in Colorado.

As with all group outbreaks, facilities should report suspected norovirus outbreaks to the local public health agency or state health department within 24 hours.

State Guidelines:

For the latest state guidelines on the management of norovirus outbreaks, visit:

<http://www.cdphe.state.co.us/dc/eip/LTCFNorovirusGuidelines.pdf>

References and Resources:

1. Colorado Department of Public Health and Environment
2. "Norwalk-Like Viruses" Public Health Consequences and Outbreak Management:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5009a1.htm>
3. Information on norovirus, including frequently asked questions:
<http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus.htm>

For more information or questions, please contact:

Colorado Department of Public Health and Environment:
(303) 692-2700 / (303) 370-9395 (after hours)
Fax: (303) 782-0338

Tri-County Health Department:
(303) 220-9200 / (303) 461-2342 (after hours)
Fax: (303) 220-9208

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