

# NOROVIRUS: DISEASE PREVENTION & OUTBREAK MANAGEMENT

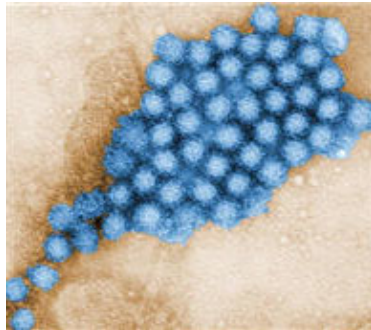
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<https://spice.unc.edu/>  
<https://spice.unc.edu/ask-spice/>

# OBJECTIVES

- ▶ Disease overview
- ▶ Clinical features & complications
- ▶ Chain of infection related to Norovirus
- ▶ Outbreak settings & healthcare facilities
- ▶ Disease prevention and control & outbreak management

# NOROVIRUS: WHAT IS IT?



- ▶ Virus that causes gastroenteritis
- ▶ Extremely contagious
- ▶ Thousands of outbreaks per year
- ▶ Leading cause of vomiting and diarrhea
- ▶ Affects people of all ages
- ▶ Occurs year round
  - ▶ Most outbreaks & illness occurring November - April

# NOROVIRUS: CLINICAL FEATURES & COMPLICATIONS

## CLINICAL FEATURES

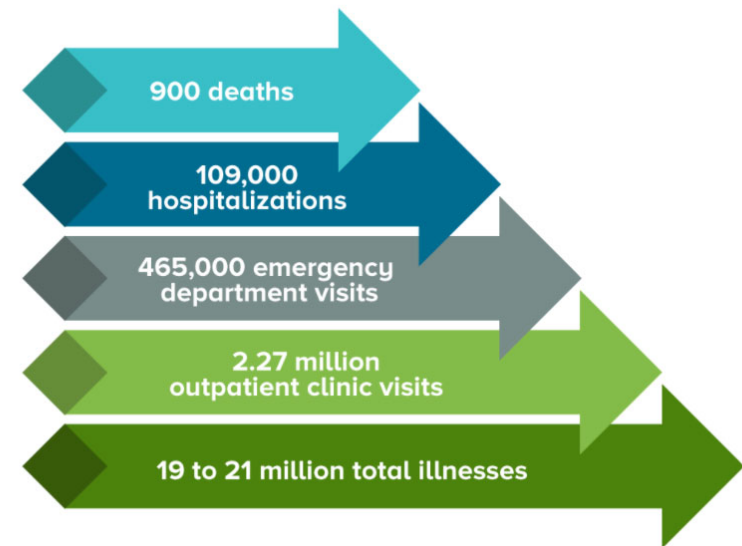
- ▶ Acute gastroenteritis
  - ▶ 12-48 hours incubation period
  - ▶ Non-bloody diarrhea
  - ▶ Vomiting
  - ▶ Nausea
  - ▶ Abdominal cramps
  - ▶ Low grade fever
  - ▶ Body aches
  - ▶ 1-3 days duration
    - ▶ 4-6 days in young, elderly & hospitalized individuals
  - ▶ 30% asymptomatic

## COMPLICATIONS

- ▶ Necrotizing enterocolitis
  - ▶ Neonates
- ▶ Chronic diarrhea
  - ▶ Immunosuppressed
- ▶ Postinfectious irritable bowel syndrome
- ▶ Death
  - ▶ Elderly & congregate care residents

# NOROVIRUS: BURDEN OF ILLNESS

- ▶ Each year, on average in the United States, norovirus causes:
  - ▶ 900 deaths, mostly among adults aged 65 and older
  - ▶ 109,000 hospitalizations
  - ▶ 465,000 emergency department visits, mostly in young children
  - ▶ 2,270,000 outpatient clinic visits annually, mostly in young children
  - ▶ 19 to 21 million cases of vomiting and diarrhea illnesses



<https://www.cdc.gov/norovirus/trends-outbreaks/illness-outbreaks-figure>

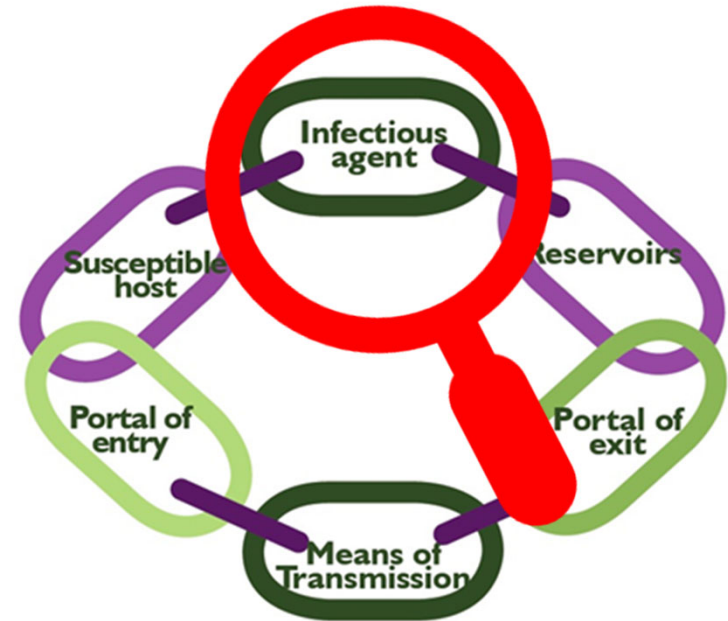
# CHAIN OF INFECTION: INFECTIOUS AGENT

## ► Norovirus

- *Caliciviridae* family
- 10 genogroups & 48 genotypes
- Non-enveloped, single stranded RNA virus
- Previously called Norwalk or Norwalk-like illness

## ► Highly infectious:

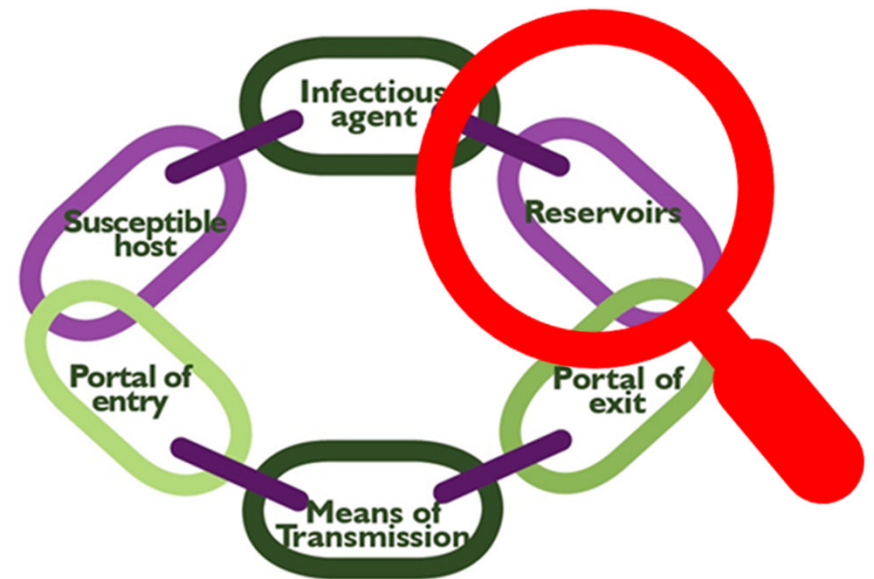
- Infectious dose = 18 viral particles
- 5 billion infectious doses/ 1 gram of feces during peak shedding
- Peak shedding = 2-5 days after infection
- Virus detection = 4 weeks
  - Contagious period unclear



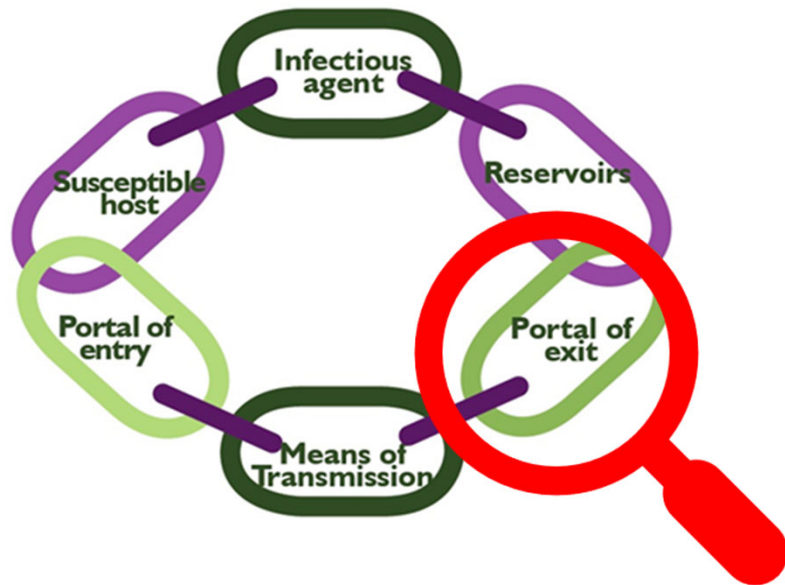
# CHAIN OF INFECTION: RESERVOIR

## ► Humans

- Only known source



# CHAIN OF INFECTION: PORTAL OF EXIT



## ► Gastrointestinal tract

### ► Mouth

- Saliva
- Vomitus

### ► Anus

- Stool



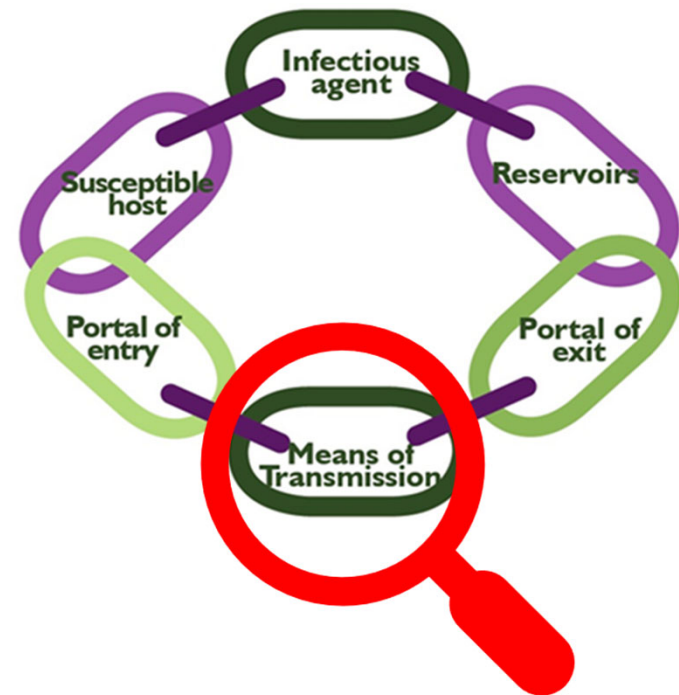
# CHAIN OF INFECTION: MEANS OF TRANSMISSION

## ▶ Person to Person

- ▶ Contact
  - ▶ Direct contact
  - ▶ Indirect contact
- ▶ Droplet
  - ▶ Aerosolized droplets of infected saliva/vomit

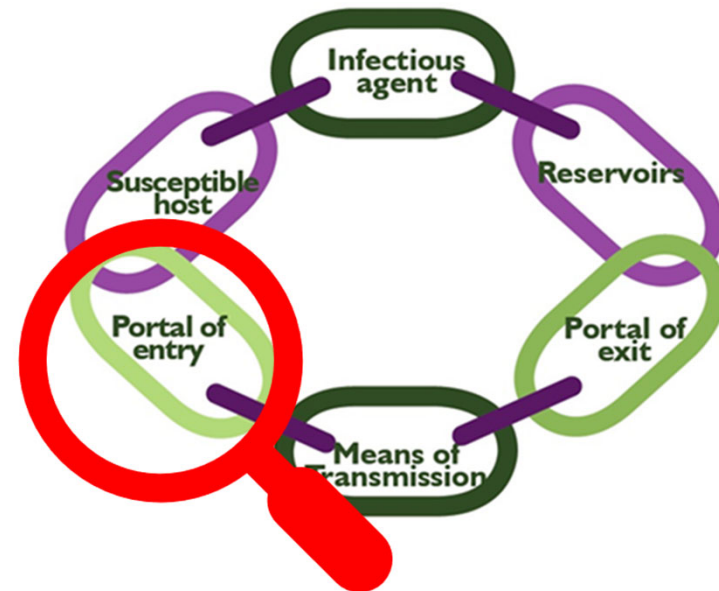
## ▶ Water/food borne

- ▶ grown/harvested w/contaminated water
- ▶ Infected person handles food
- ▶ Food is placed/prepared on contaminated surface
- ▶ Septic tank leaks into well
- ▶ Infectious person defecates/vomits into water
- ▶ Water treatment is lacking

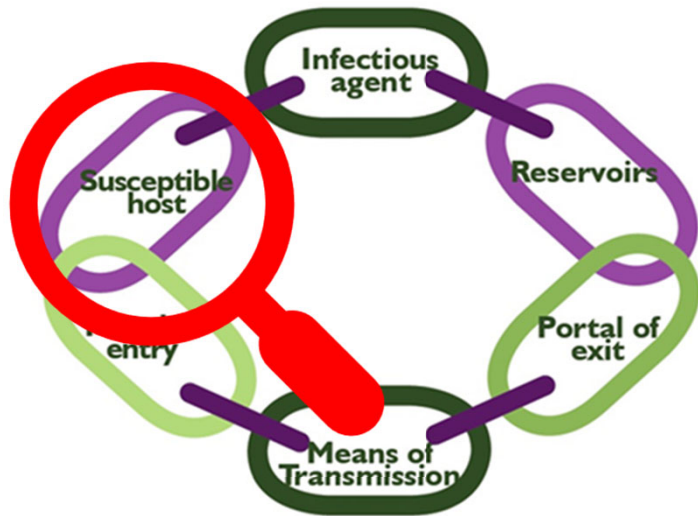


# CHAIN OF INFECTION: PORTAL OF ENTRY

## ► Mouth

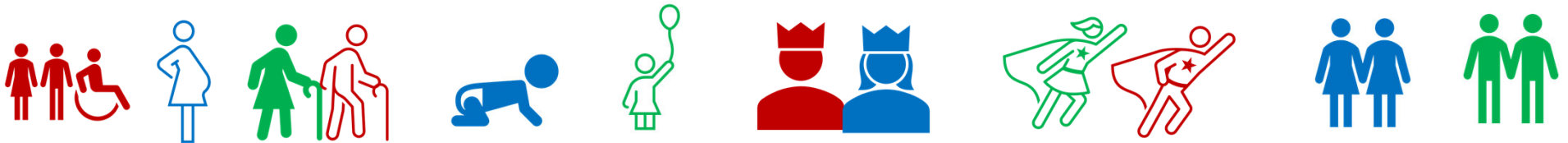


# CHAIN OF INFECTION: SUSCEPTIBLE HOST



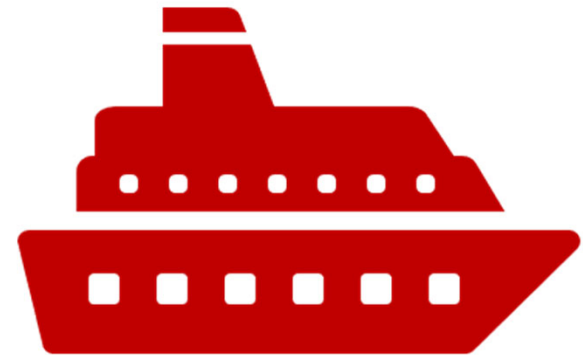
## ► All individuals

- Most susceptible to severe/prolonged disease and complications
  - Young
  - Elderly
  - immunosuppressed
  - Chronically ill



# NOROVIRUS: OUTBREAK SETTINGS

- ▶ Cruise ships
- ▶ Restaurants & catered events
- ▶ Schools & childcare centers
- ▶ Healthcare facilities



# NOROVIRUS: HEALTHCARE FACILITIES

- ▶ Most common setting
- ▶ > 50% of outbreaks
- ▶ Extended duration
- ▶ More severe
  - ▶ Fatal
- ▶ Multiple means of outbreak origin
  - ▶ Patients/residents
  - ▶ Staff
  - ▶ Visitors
  - ▶ Contaminated food/water



# WHAT CONSTITUTES AN OUTBREAK?

## ► Definition of a Norovirus outbreak:

- An outbreak of Norovirus is defined as an occurrence of two or more similar illnesses resulting from a common exposure that is either suspected or laboratory-confirmed to be caused by Norovirus.



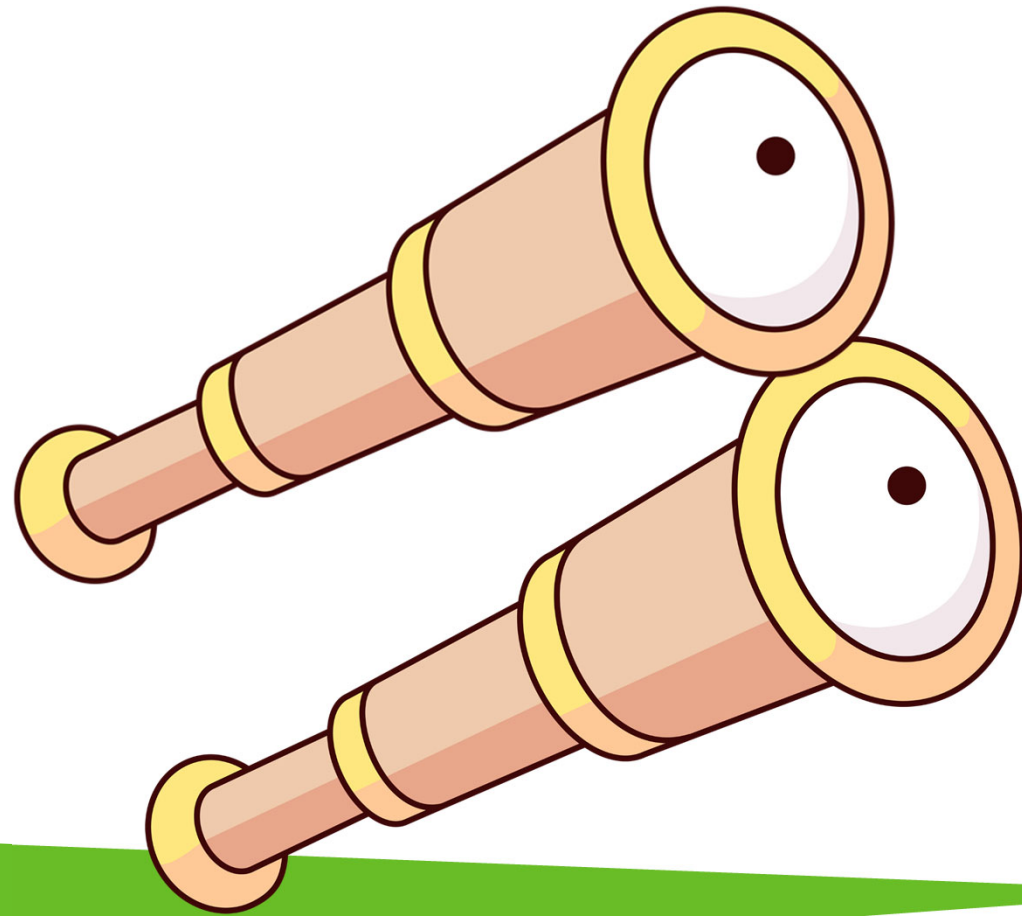
<https://www.cdc.gov/norovirus/trends-outbreaks/responding.html>

# RESPONDING TO A NOROVIRUS OUTBREAK: YOU ARE NOT ALONE

- ▶ State, local & territorial departments:
  - ▶ Serve as lead agencies in most investigations of Norovirus outbreaks
    - ▶ Interview patients
    - ▶ Collect stool specimens
    - ▶ \* perform diagnostic testing
- ▶ Centers for Disease Control and Prevention (CDC)
  - ▶ Provide epidemiological consultations & tools
  - ▶ Testing specimens and genotype positive samples
  - ▶ Coordinate multi-state outbreak investigations as needed
- ▶ Food regulatory agencies (FDA, USDA & State authorities)
  - ▶ Collaborate with HDs when link between contaminated food & illness is identified
  - ▶ Perform food testing for specific food (shellfish & produce)
  - ▶ Coordinate recalls of food involved in outbreaks



# OUTBREAK MANAGEMENT IN THE HEALTHCARE SETTING



- ▶ Hand hygiene
- ▶ Patient cohorting
- ▶ Transmission based precautions & Personal Protective Equipment (PPE)
- ▶ Patient transfers/ward closures
- ▶ Indirect patient care staff
- ▶ Diagnostics
- ▶ Environmental cleaning
- ▶ Staff and leave policy
- ▶ Visitors
- ▶ Education
- ▶ Active case findings
- ▶ Communication & notification



# HAND HYGIENE

- ▶ Promote hand hygiene
- ▶ # 1 way of preventing & transmitting infection
- ▶ Soap & water during outbreaks



# RESIDENT PLACEMENT & COHORTING



- ▶ Private room if available
- ▶ Place in multi-occupancy rooms/areas
- ▶ Identify Isolation wards/halls
- ▶ Separate from asymptomatic individuals

# TRANSMISSION-BASED PRECAUTIONS & PPE

## ► Enteric Precautions

- Clean hands before entering and when leaving room (Everyone)
- Wear gloves when entering room and remove before leaving room (HCP)
- Wear gown when entering room and remove before leaving (HCP)
- Use patient dedicated equipment or single-use disposable equipment when possible/clean & disinfect with EPA registered disinfectant with a kill claim for Norovirus or 1:10 dilution of bleach between patient use (HCP)
- Wash hands with soap & water when leaving room during outbreaks (Everyone)


STOP

ENTERIC PRECAUTIONS  
PRECAUCIONES DE TRANSMISIÓN POR  
ENTÉRICA


ALTO

Family/Visitors should not visit if having signs or symptoms of an infection or a communicable disease. Visitation also based on facility's policy.  
*Los familiares y visitantes no deben visitar si tienen señales o síntomas de infección o de una enfermedad contagiosa. Las visitas también dependen de la política de la instalación.*


*Follow instructions below before entering room.  
Antes de entrar a la habitación, siga las instrucciones a continuación.*

☒


**Everyone must:**  
**Clean hands before entering and when leaving room.**  
***Todos deben:**  
Lavarse las manos antes de entrar y antes de salir de la habitación.*

☒

**All Healthcare Personnel must:**  
***Todo el personal de atención médica debe:***  
**Wear gloves when entering room and remove before leaving room.**  
*Usar guantes al entrar a la habitación y quitárselos antes de salir de la habitación.*

☒

**Wear a gown when entering room and remove before leaving.**  
*Usar una bata al entrar a la habitación y quitársela antes de salir.*

☒

**Use patient-dedicated or single-use disposable equipment. If shared equipment is used, clean with an EPA K list disinfectant.**  
*Usar equipo desechable de un solo uso o designado al paciente. Si se usa equipo compartido, limpiarlo con un desinfectante de la lista K de la EPA.*

Additional PPE may be required per Standard Precautions.  
*Es posible que se exija utilizar equipo de protección personal adicional según las precauciones estándar.*



Translated by UNC Health Interpreter Services

**REVISED DATE: 1/20/2022**

# TRANSMISSION-BASED PRECAUTIONS & PPE



## ► Droplet



- Perform hand hygiene before entering/leaving room (Everyone)
- Wear mask when entering room and remove after exiting the room (Everyone)
- Use in conjunction with Enteric Precautions when patient is actively vomiting

**DROPLET PRECAUTIONS**  
**PRECAUCIONES DE TRANSMISIÓN POR GOTAS**

Family/Visitors should not visit if having signs or symptoms of an infection or a communicable disease. Visitation also based on facility's policy.  
*Los familiares y visitantes no deben visitar si tienen señales o síntomas de infección o de una enfermedad contagiosa. Las visitas también dependen de la política de la instalación.*

*Follow instructions below before entering room.*  
*Antes de entrar a la habitación, siga las instrucciones a continuación.*

**Everyone must:**  
Clean hands before entering and when leaving room.  
***Todos deben:***  
*Lavarse las manos antes de entrar y al salir de la habitación.*

**Wear surgical/procedure mask when entering the room and remove after exiting the room.**  
*Usar una mascarilla quirúrgica o para procedimientos al entrar a la habitación y quitársela después de salir de la habitación.*

**Additional PPE may be required per Standard Precautions.**  
*Es posible que se exija equipo de protección personal adicional según las precauciones estándar.*

Translated by UNIC Health Interpreter ServicesREVISED DATE: 1/20/2022

# OTHER ISOLATION PRECAUTIONS DURING AN OUTBREAK

## Transmission-based precautions

- Minimum 48 hours AFTER resolutions of symptoms

## Private rooms if possible

- Cohorting patients
- Designate contagious areas/sections (halls/wings)

## Minimize patient movement

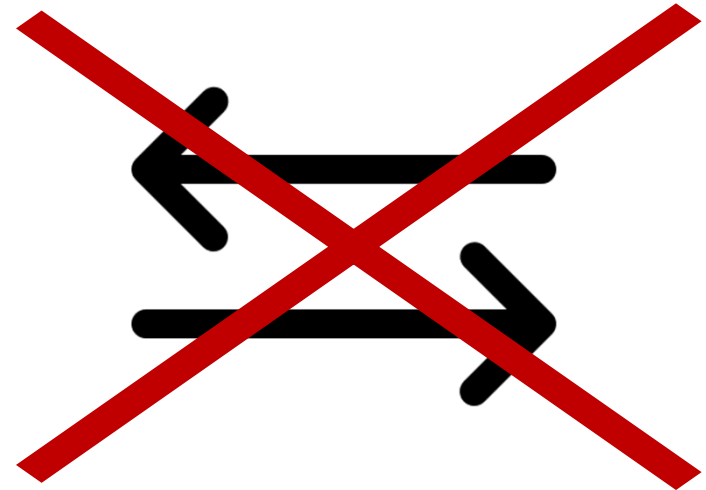
- Keep within contagious areas/sections
- Restrict from leaving area unless necessary for treatment
- Suspend group activities

## Staff considerations

- Recent recovered staff, who were suspected of Norovirus infection associated with outbreak, may be best suited to care for symptomatic residents until outbreak resolves

# TRANSFERS & WARD CLOSURES

- ▶ Closure of wards
  - ▶ New admissions
  - ▶ Inbound transfers
- ▶ Limit outbound transfers
  - ▶ Only if receiving facility can maintain Enteric Precautions
  - ▶ Medically suitable patients/residents can be discharged home to residence
- ▶ Implement notification protocols



## INDIRECT PATIENT CARE STAFF

- ▶ Staff preparing, handling or serving food
  - ▶ Educated/reeducated on importance of hand hygiene
  - ▶ If symptomatic for Norovirus must be excluded from duty
  - ▶ Remove all shared or communal food for both patients/residents & staff



[https://www.cdc.gov/infectioncontrol/guidelines/norovirus/index.html#anchor\\_1554726313](https://www.cdc.gov/infectioncontrol/guidelines/norovirus/index.html#anchor_1554726313)



# DIAGNOSTICS

- ▶ Policy development and adoption
  - ▶ Revised McGeer Criteria for Norovirus
- ▶ Early submission of stool specimens
  - ▶ During acute phase (2 – 3 days of onset)
  - ▶ Consult with state & local health authorities
- ▶ Use effective laboratory diagnostic protocols for testing of suspected cases
- ▶ Vomitus can be used when stool specimens are unavailable
  - ▶ Less sensitive due to lower detectable viral concentrations
- ▶ Kaplan's Criteria
  - ▶ Absence of clinical laboratory diagnostics
  - ▶ Delay in obtaining lab results

## ▶ Kaplan's Criteria

- ▶ Vomiting in more than half of symptomatic cases **AND**
- ▶ Average incubation period of 24 - 48 hours **AND**
- ▶ Average length of illness of 12 – 60hrs **AND**
- ▶ No bacterial pathogens isolated from stool culture

<https://www.cdc.gov/hai/pdfs/norovirus/229110a-noroviruscontrolrecomm508a.pdf>



# REVISED MCGEER CRITERIA FOR NOROVIRUS

LTC Gastrointestinal (GI) Tract & Norovirus Infection Worksheet  
(McGeer Criteria 2012)

Type of Infection:

Resident Name	MR#	Date of Admission	Resident Location (hall/room #)
Relevant findings (date of + toxin, date of stool culture, organism(s), vital signs, etc.)		Date of ONSET of S&S	<input type="checkbox"/> ≤ 2 calendar days = Community acquired <input type="checkbox"/> > 2 calendar days after admit = facility acquired
Date of Infection		Person completing form	

Type of Infection	Signs and Symptoms	Comments
<input type="checkbox"/> Gastro-enteritis	<b>MUST HAVE at least 1 of the following:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-hour period</li> <li><input type="checkbox"/> Vomiting: 2 or more episodes in a 24-hour period</li> <li><input type="checkbox"/> Both of the following:                             <ul style="list-style-type: none"> <li>Stool specimen testing positive for a pathogen (e.g., <i>Salmonella</i>, <i>Shigella</i>, <i>Escherichia coli</i> O157:H7, <i>Campylobacter</i> species, rotavirus)</li> <li>At least 1 of the following:                                     <ul style="list-style-type: none"> <li>Nausea</li> <li>Vomiting</li> <li>Abdominal pain or tenderness</li> <li>Diarrhea</li> </ul> </li> </ul> </li> </ul>	Care must be taken to exclude noninfectious causes of symptoms. For instance, new medications may cause diarrhea, nausea, or vomiting; initiation of new enteral feeding may be associated with diarrhea; and nausea or vomiting may be associated with gallbladder disease. Presence of new GI symptoms in a single resident may prompt enhanced surveillance for additional cases. In the presence of an outbreak, stool specimens should be sent to confirm the presence of norovirus or other pathogens (e.g., rotavirus or <i>E. coli</i> O157:H7)

<input type="checkbox"/> Norovirus	<b>MUST HAVE at least 1 of the following:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-hour period</li> <li><input type="checkbox"/> Vomiting: 2 or more episodes in a 24-hour period</li> </ul> <b>MUST HAVE at least 1 of the following:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Stool specimen for which norovirus enzyme immunoassay, or molecular reaction (PCR)</li> </ul>
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<b>X Norovirus</b>	<b>MUST HAVE at least 1 of the following:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-hour period</li> <li><input type="checkbox"/> Vomiting: 2 or more episodes in a 24-hour period</li> </ul> <b>MUST HAVE at least 1 of the following:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Stool specimen for which norovirus is positively detected by electron microscopy, enzyme immunoassay, or molecular diagnostic testing such as polymerase chain reaction (PCR)</li> </ul>
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In the absence of laboratory confirmation, an outbreak (2 or more cases occurring in a long-term care facility [LTCF]) of acute gastroenteritis due to norovirus infection may be assumed to be present if all of the following criteria are present ("Kaplan Criteria"):

- (a) vomiting in more than half of affected persons;
- (b) a mean (or median) incubation period of 24–48 h;
- (c) a mean (or median) duration of illness of 12–60 h;
- and (d) no bacterial pathogen is identified in stool culture.

Surveillance Definitions of Infections in Long-Term Care Facilities: Revisiting the McGeer  
Infection Control Hospital Epidemiology 2012;33(10):965-977

# ENVIRONMENTAL CLEANING

- ▶ Perform routine cleaning & disinfection of high touch surfaces & equipment in isolation/cohort areas as well as high traffic clinical areas

- ▶ Commodes
- ▶ Toilets
- ▶ Faucets
- ▶ Hand/bed rails
- ▶ Telephones
- ▶ Door handles
- ▶ Computer equipment
- ▶ Kitchen prep surfaces

- ▶ Increase frequency of cleaning and disinfection in resident care areas during an outbreak

- ▶ Twice daily on unit/ward level
- ▶ Three times a day for high touch surfaces



# ENVIRONMENTAL CLEANING

- ▶ Low contamination to high contamination
- ▶ Change mop heads
  - ▶ When preparing new solution
  - ▶ After cleaning large spills of emesis/stool
- ▶ Clean & disinfect shared patient care equipment & environmental surfaces
  - ▶ EPA registered disinfectant/bleach 1:10 dilution
  - ▶ Follow recommendations for application/contact times
- ▶ Standard precautions when handling soiled patient care items including linens
  - ▶ Handle carefully avoiding agitation
  - ▶ Launder unused linen
  - ▶ Double bagging, incineration or modifications not indicated
- ▶ Change privacy curtains routinely & upon discharge/transfer
- ▶ No need to use disposable utensils/dishware



# ENVIRONMENTAL CLEANING

- ▶ **Clean first then disinfect**

- ▶ **EPA's registered disinfectant products effective against Norovirus**

- ▶ Proper PPE

- ▶ **Chlorine bleach**

- ▶ Bleach wipes
  - ▶ No mixing required
  - ▶ Safer for staff

- ▶ **Chlorine bleach**

- ▶ Use for food/mouth contact items, toys;
  - ▶ 1 tablespoon of bleach in 1 gallon water
  - ▶ (1:250 dilution).
- ▶ Use for most nonporous surfaces:
  - ▶ 1/3 cup bleach in 1 gallon water (1:50 dilution)
- ▶ Use for heavily contaminated nonporous surfaces:
  - ▶ 1 and 2/3 cups bleach in 1 gallon water (1:10 dilution).
- ▶ Contact time
  - ▶ Leave bleach on surface for 10-20 minutes and then rinse thoroughly with clean water
- ▶ Stability of chlorine bleach
  - ▶ Good for 30 days after opened
  - ▶ Prepare fresh dilution everyday
  - ▶ Discard unused portions
    - ▶ End of day
    - ▶ After day 30

# STAFF LEAVE AND POLICY

- ▶ Exclude ill staff from work
  - ▶ 48 hours after resolution of symptoms
  - ▶ Encourage frequent hand hygiene
  - ▶ Best suited to care for ill residents/patients once returned
- ▶ Cohort staff
  - ▶ Care for one resident/patient cohort (ill/well)
- ▶ Exclude non-essential staff, students & volunteers from areas experiencing outbreak



# VISITORS

- ▶ Establish visitor policies
- ▶ Communicate outbreak with visitors
- ▶ Educate visitors



# EDUCATION

- ▶ Staff, patients/residents & visitors
  - ▶ Knowing the symptoms
  - ▶ Preventing infection & modes of transmission
    - ▶ Upon the recognition & throughout outbreak duration
- ▶ Provide educational sessions & resources on the prevention/management before outbreaks occur
  - ▶ Annual training
  - ▶ Sporadic cases are detected





# ACTIVE CASE FINDING



- ▶ Begin when outbreak is suspected or when cluster is detected
- ▶ Use specified case definition
- ▶ Implement line lists
- ▶ Collect relevant epidemiological, clinical, demographic data & resident/patient location and outcomes



# COMMUNICATION & NOTIFICATION

## ► Policies and procedures

- Specify chain of communication needed to manage/report an outbreak

## ► Key stakeholders

- Healthcare administration
- Local health department
- Clinical staff
- Environmental services
- State/local public health authorities



# SUMMARY

- ▶ Disease overview
- ▶ Clinical features & complications
- ▶ Chain of infection related to Norovirus
- ▶ Outbreak settings & healthcare facilities
- ▶ Disease prevention and control & outbreak management

## RESOURCES

- ▶ <https://www.cdc.gov/norovirus/about/transmission.html>
- ▶ <https://www.cdc.gov/norovirus/trends-outbreaks/responding.html>
- ▶ <https://www.cdc.gov/infectioncontrol/guidelines/norovirus/index.html>
- ▶ <https://www.cdc.gov/infectioncontrol/pdf/guidelines/norovirus-guidelines.pdf>
- ▶ <https://www.cdc.gov/hai/pdfs/norovirus/229110a-noroviruscontrolrecomm508a.pdf>
- ▶ <https://www.epa.gov/system/files/documents/2021-07/2021-06-22-list-g.pdf>
- ▶ <https://www.osha.gov/sites/default/files/publications/norovirus-factsheet.pdf>
- ▶ <https://spice.unc.edu/>
- ▶ <https://spice.unc.edu/ask-spice/>

# QUESTIONS?

