NOROVIRUS: DISEASE PREVENTION & OUTBREAK MANAGEMENT

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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-envelope, 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.

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)
**TRANSMISSION-BASED PRECAUTIONS & PPE**

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

https://www.cdc.gov/infectioncontrol/guidelines/norovirus/index.html#anchor_1554726313
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
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

<table>
<thead>
<tr>
<th>Resident Name</th>
<th>MRR</th>
<th>Date of Admission</th>
<th>Resident Location (hall/room #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant findings (date of + toxin, date of stool culture, organism(s), vital signs, etc.)</td>
<td>Date of ONSET of S&amp;S</td>
<td>Date of ONSET of S&amp;S</td>
<td></td>
</tr>
</tbody>
</table>

#### Type of Infection

**Gastroenteritis**

- **MUST HAVE at least 1 of the following:**
  - Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-hour period
  - Vomiting: 2 or more episodes in a 24-hour period
  - Both of the following:
    - Stool specimen testing positive for a pathogen (e.g., *Salmonella*, *Shigella*, *Escherichia coli* O157:H7, *Campylobacter* species, *rotavirus*)
    - At least 1 of the following:
      - Nausea
      - Vomiting
      - Abdominal pain or tenderness
      - Diarrhea

**Norovirus**

- **MUST HAVE at least 1 of the following:**
  - Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-hour period
  - Vomiting: 2 or more episodes in a 24-hour period
  - **MUST HAVE at least 1 of the following:**
    - Stool specimen for which norovirus is positively detected by electron microscopy, enzyme immunoassay, or molecular diagnostic testing such as polymerase chain reaction (PCR)

**Comments**

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 *E. coli* O157:H7).

**Norovirus**

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.
ENVIROMENTAL 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
  - 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/infectioncontrol/guidelines/norovirus/index.html
- https://spice.unc.edu/
- https://spice.unc.edu/ask-spice/
QUESTIONS?