OUTBREAK INVESTIGATION - NOROVIRUS
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STEP 1: PREPARE FOR POSSIBLE OUTBREAK INVESTIGATION
• Research the disease and gather information
• Notify administration and other facility personal to make arrangements for restrictions of residents, visitors and personal.
• Determine whether the local health department should be notified.

STEP 2: ESTABLISH EXISTENCE OF OUTBREAK
• Verify that a suspected outbreak is a real outbreak.
• Determine the expected number of cases existing in the facility.
  • Compare the current number of cases with the number from the previous few weeks or months, or with a comparable period during the previous few years.
  • Consider whether the collection method used to collect infection control data has changed and may be the reason for an increase number of cases.
  • Determine whether a new person is collecting the data. This may result in an increase number of cases, because the new person may have different knowledge base related to infection prevention.

RESEARCH THE DISEASE
• COLLECTING DATA FOR ANALYSIS
  • What is happening?
  • What do you know?

HISTORY OF NOROVIRUS
• First identified in Norwalk, Ohio in 1968
• Most common cause of gastroenteritis
  • Responsible for at least 50% of all gastroenteritis outbreaks worldwide
  • Major cause of foodborne illness
  • 21 million illnesses in the U.S. annually
• CDC published recommendations in 2001 (MMWR 2001;50[No. RR-9]

SAMPLE OUTBREAK INVESTIGATION FORM – RESEARCH AND GATHER INFORMATION
SAMPLE STAFF OUTBREAK TRACKING FORM

REPORTING OUTBREAK/POSSIBLE OUTBREAK TO THE EPIDEMIOLOGY BRANCH OF THE LOCAL HEALTH DEPARTMENT

OUTBREAKS

- Restaurants
- Nursing Homes/Hospitals
- Schools/Day Care
- Vacation Settings
- Other Settings

STEP 3: VERIFY DIAGNOSIS

- Identify as accurately as possible the specific nature of the disease.
- Verify the diagnosis following these procedures:
  - Ensure that the problem has been properly diagnosed.
  - For infectious or toxic-chemical agents, ensure that the increased diagnosed cases is not a result of a mistaken laboratory analysis.
  - Ensure that the increase in the number of residents or workers reporting a symptom is not due to their increased awareness.
  - If there is any question about the laboratory findings, you should have the laboratory review the results.
  - For outbreaks involving infectious or toxic-chemical agents, ensure that the increase in diagnosed cases is not a result of a mistake in the laboratory.
  - Review the laboratory analysis of the residents or workers who have reported a symptom.
  - If you require specialized laboratory work (for example, Pulse Field Gel Electrophoresis [PFGE], special culturing, etc.), contact your local health department and begin collecting specimens, isolates, or any other specimens so that they can be submitted to the local health department.
  - Personally, visit and assess several residents who are ill to gain a better understanding of the disease and those affected.

CLINICAL FEATURES

- Symptoms resolve without treatment after 1-3 days in healthy people
- Causes can last 4-6 days among young children, elderly persons, and hospitalized patients
- 10% seek medical treatment
- Treatment includes:
  - Hospitalization
  - Treatment for dehydration
- Deserts under any circumstances
- Long-term care facilities
- Necrotizing enterocolitis
- Necrotizing enterocolitis among neonates
- Necrotizing enterocolitis in immunosuppressed patients
- Postinfectious irritable bowel syndrome
CLINICAL FEATURES

- Shed in stool and vomitus
- Stool 4 weeks following infection
- Peak viral shedding 2-5 days after infection
- 100 billion vial copies per gram of stool
- 30% of norovirus infections are asymptomatic
- Unclear if asymptomatic persons can cause an outbreak

STEP 4: DEFINE & IDENTIFY CASES

- Establish a case definition. A case definition usually includes four components:
  - Clinical information about the disease
  - Characteristics about the people who are affected
  - Information about the location or place
  - A specification of time during which the outbreak occurred
- Use the clinical criteria on the following simple and objective measures:
  - For example, you might require the presence of three (3) or more loose bowel movements per day
- Regarding the characteristics of the residents or staff, you might restrict the definition to those who attended a specific activity, ate a specific food, or participated in a specific outing.
- By time, the criterion might be onset of illness within the past three (3) days; by place, to include all residents and staff on the same unit.
- Whether the situation, you must apply them consistently and without bias to all of the residents and staff included in the investigation.

STEP 4: DEFINE & IDENTIFY CASES

- Your case definition should be broad enough to include most, if not all, of the actual cases, without capturing what are called "false-positive" cases.
- Confirmed cases: must have laboratory verification
- Probable cases: usually have the typical clinical features of the disease
- Possible cases: usually have fewer of the typical clinical features
- Whatever the criteria, you must apply them consistently and without bias to all of the residents and staff included in the investigation.

DIAGNOSTIC METHODS

- Real-time reverse transcription polymerase chain reaction (RT-PCR) assay
- TaqMan-based real-time assays
- RIDASCREEN Norovirus 3rd Generation enzyme immunoassay (EIA) for preliminary identification
- Negative EIA should be confirmed by RT-PCR reference methods

SPECIMEN COLLECTION

- Whole stool specimens preferred over rectal swabs
- Vomitus
- Sensitivity of testing not as good as stool

STOOL

- Collect as early as possible
- Can also do bacterial or parasitic agents at the same time
- Collect specimen
  - Acute phase of illness (within 48-72 hours after onset)
  - Vomitus is still liquid or semi-solid, and excretion is at its peak
  - Can be collected later or after resolution of diarrhea up to 7-10 days after onset
  - Collection later may not be reliable
- Number and quantity
  - Whole stool from at least 5 ill persons (more if obtained after 72 hours or large outbreaks)
  - EIA testing six specimens should be collected
  - Bulk samples ~ 10-50ml of whole stool placed in a stool cup or urine container
Whole stool kept refrigerated at 39°F (4°C) if testing occurs within 2-3 weeks.
- If being transported for testing, individually package and keep on ice or frozen refrigerant packs in an insulated bag.
- Testing is required to occur 1-2 weeks after collection for archiving purposes.
- Samples should be treated at 4-49°F.
- Fresh samples can be collected 2-3 days when samples are stored under these conditions.
- Vomitus
- Collection, storage and transport same as stool.
- Serum:
  - May be used for special studies but not recommended for routine diagnostics.
- Environmental Specimens:
  - Only testing for water and shellfish are currently available.
- Other environmental specimens collection would be determined by CDC.

**STEP 4: DEFINE & IDENTIFY CASES**

- The following information should be collected from residents, staff and visitors for all disease investigations:
  - **Identifying information:** This may include name, address and telephone number.
  - **Demographic information:** This may include age, sex, race and occupation.
  - **Risk factor information:**
  - **Clinical information:**
    - **Identifying information:** This may include name, address and telephone number.
    - **Demographic information:** This may include age, sex, race and occupation.
    - **Risk factor information:**
    - **Clinical information:**
      - **Identifying information:** This may include name, address and telephone number.
      - **Demographic information:** This may include age, sex, race and occupation.
      - **Risk factor information:**
      - **Clinical information:**

**STEP 5: DESCRIBE & ORIENT DATA IN TERMS OF TIME, PLACE & PERSON**

- Once all the data has been collected, we begin to characterize an outbreak by time, place and person.
  - **By time:** Outbreaks are characterized by three overlapping stages:
    1. Incubation period
    2. Incubation period
    3. Incubation period
  - **By place:** Outbreaks may occur in a specific locale.
  - **By person:** Outbreaks may involve one or more individuals.

**STEP 6: DEVELOP HYPOTHESES**

- Hypotheses will be developed to explain why and how an outbreak occurred.
- Interview of other ill people.
- Speak to local health officials in the community (What do community health officials know?)
- Spread to local health officials in the community (What do community health officials know?)
- Speech to local health officials in the community (What do community health officials know?)
- **Mode of transmission**
  - **Oral:** The usual source
  - **Water:** The usual source
  - **Environmental:** The usual source

**TRANSMISSION**

- **Extremely contagious**
  - Infectious dose as low as 18 viral particles
  - Only testing for water and shellfish are currently available
  - Humans are reservour
  - Transmission occurs by three routes:
    - Person-to-person
    - Foodborne
    - Waterborne
TRANSMISSION

- Person-to-Person
  - Directly through fecal-oral route
  - Indirect exposure via family or contaminated environmental surfaces
- Foodborne transmission
  - Consumption of infected food handled by ill individuals
  - Food distribution system - contamination during production or preparation
- Recreational and drinking water
  - Water contaminated from septic tank leakage or sewage
  - Breakdowns in chlorination of municipal systems

STEP 8: REFINE HYPOTHESES & CARRY OUT ADDITIONAL STUDIES

BREAKING THE CHAIN OF INFECTION

PREVENTION AND CONTROL

- Hand Hygiene – Single most important method to prevent infection and control transmission (20 seconds)
  - Plain or antiseptic soap and water
  - Efficacy of alcohol-based sanitizers remain controversial
- Exclusion and Isolation
  - Most practical way to interrupt transmission and limiting contamination of the environment
  - Minimizes contact with persons during the most infectious periods of illness
  - Isolation of exposed and unexposed well persons may be very useful
  - Cohort units/stop staff floating between units/close facility to new admission

STEP 9: IMPLEMENT CONTROL & PREVENTION MEASURES

- Although implementing control and prevention measures is listed here as Step 9, you should begin this process as soon as you identify the possible outbreak.
  - Control measures should be aimed at specific links in the chain of infection, the agent, the source or the reservoir.
  - In some situations, you may implement direct control measures to interrupt transmission or exposure.
    - Contact/droplet precautions

PREVENTION AND CONTROL

- Environmental Disinfection
  - Key to interrupt norovirus spread from contaminated environmental surfaces
  - Bathrooms
  - High-touch surfaces (door knobs, handrails)
  - Chlorine bleach (efficacy well documented) or other commercial product registered with EPA as effective against norovirus
    - List of approved products: [http://www.epa.gov/oppad001/list_g_norovirus.pdf](http://www.epa.gov/oppad001/list_g_norovirus.pdf)
  - Chlorine bleach solution should be applied to nonporous surfaces
    - Concentration of 1,000-5,000 ppm (5-25 tablespoons of household bleach per gallon of water)
    - Good for only 24 hours
    - 5,000 ppm on fecally soiled surfaces need 4 minutes to inactivate
  - Follow all manufacturer recommendations for whatever product you use
STEP 10: COMMUNICATE FINDINGS

- Finally, you must communicate your findings to others who need to know, such as administration, the director of nursing, all staff, all residents and all resident families. You can communicate information during a meeting with all parties involved or with a written report that is mailed to all involved.

- If a written report is sent, it should include an introduction, background, methods, results, discussion and recommendation. Should this written report find its way into the hands of the general public, it will serve a broader purpose of contributing to the scientific knowledge base of epidemiology and public health. Stick to the facts only.

IMPACT OF NOROVIRUS OUTBREAK ON AFFECTED UNITS

IMPACT OF NOROVIRUS OUTBREAK ON RESIDENTS/STAFF

REPORTING AND ASSISTANCE

- Individual cases are not notifiable
- Outbreak should be reported to the appropriate local and state health departments
- Other support
  - CDC Norovirus Program
  - National Center for Immunization and Respiratory Diseases
  - National Outbreak Reporting System
- Usually done by local/state health departments

NOROVIRUS CHECKLIST

- Resident identified with possible norovirus
- Notify DOH, Administrator
- Notify all staff in the facility
- Stop all interunit floating including PT/OT/Therapy personnel
- Exclude all non-essential personnel from the affected unit
- Isolation of any resident from the affected unit to another facility, home or another area in the facility
- Consider stopping admissions
- Consider stopping visitors to affected area
- Reopen affected area 72 hours after the last new case
- Keep line listing
- Keep line listing
- Sick employees may return to work when they have been 48 hours symptom free
- Wash hands with soap and water
- Wear a surgical mask and eye protection when entering room
- Wear isolation gown
- Change gowns between residents
- Wear gloves with all resident and environmental contact
- Remove PPE prior to leaving the room
- Use Clorox/other norovirus disinfectant wipes to clean facet handles after washing hands

STAFF INSTRUCTIONS

- Wear a surgical mask and eye protection when entering room
- Wear an isolation gown – change gowns between residents
- Wear gloves with all resident and environmental contact
- Remove PPE prior to leaving the room
- Use Clorox/other norovirus disinfectant wipes to clean facet handles after washing hands
- Wash hands with soap and water
- Sick employees may return to work when they have been 48 hours symptom free
- Wear isolation gown
- Change gowns between residents
- Remove PPE prior to leaving the room
- Use Clorox/other norovirus disinfectant wipes to clean facet handles after washing hands
- Wash hands with soap and water
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OTHER RECOMMENDATIONS

- Remove ALL food from resident rooms
- Discard ALL food stored in the refrigerator that family members may have brought into the facility
- Identify who will monitor staff compliance with precautions on ALL three shifts
- Identify who will track volunteers and educate them on the norovirus prevention checklist and other requirements
- Consider posting "Wash Hands with Soap and Water Only" signs
- Keep all cubicle curtains closed between all residents in the room
- Affected residents should stay in the room whether or not they are sick
- Non-affected residents in room should use the bedside commode or clean the toilet bowl and seat after each resident use
- Staff should wear masks and eye protection if emptying bedside commode
- No paper plates or cups are needed
- No sharing of items from the affected area to other areas
- Disinfect ice machines

POST NORO OUTBREAK – 7 DAYS AFTER THE LAST SYMPTOMS

- Change and launder cubicle curtains
- Cut the cloth light cord and replace it
- Thoroughly clean the entire room including side rails, call lights, bedside stands, all surfaces
- Clean carpet and soft furnishing with hot water and detergent, or steam clean. VACUUM CLEANING IS NOT RECOMMENDED

REFERENCES

- www.cdc.gov/norovirus/hcp/index.html
- Centers for Disease Control & Prevention. "EXCITE!" Available at www.cdc.gov/excite
- http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6003al.html