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Measles Webinar

06/02/2017

Measles

- Respiratory disease
- Fever
- Cough
- Runny nose
- Red, watery eyes
- Maculopapular rash
  - Begins at the head and spreads to the rest of the body
  - Begins 3-5 days after symptoms start
- Koplik spots
  - Begins 2-3 days after symptoms start

Begins 3-5 days after symptoms start
Three Clinical Stages

- Incubation
- Prodromal with an enanthem
- Exanthem stage with fever

Rash and Conjunctivitis

Koplik spots on the palate

Koplik spots on the palate

Koplik spots on the palate
Atypical and Modified Measles

- Modified – History of vaccination or IG
  - Atypical measles
    - Killed measles vaccine given from 1963-1967
    - Prodrome is infrequent.
    - Severe headache, abdominal pain, myalgias, respiratory symptoms, pneumonia, and an atypical rash.
    - Rare Koplik spots
Complications

- Common
  - Otitis media
  - Bronchopneumonia
  - Laryngotracheobronchitis
  - Diarrhea

- Serious
  - 1/1000 cases – acute encephalitis
  - 1-2 / 1000 cases – die from respiratory/neurologic complications
  - Subacute sclerosing panencephalitis (SSPE) 7-10 years after measles infection

Presentation in those previously vaccinated

1. Fever to 101, no cough, conjunctivitis, but did report coryza. Rash started on face and went to chest and part of arms. Did not descend to extremities. Case had traveled to China, had no known exposure

2. Reported subjective fever, cough, conjunctivitis, no coryza. Rash started on face and progressed to chest, arms then stomach; rash duration was 4 days. Case was exposed to measles in an urgent care waiting room

3. Fever to 101, no cough, no coryza, no conjunctivitis. Rash started on face and descended to body, arms, legs. Rash duration was 3 days. Exposed to measles by household contact.

4. Subjective fever, conjunctivitis, no cough, no coryza. Rash spread from head and descended, rash duration unknown. Exposed to measles by a CA measles case on a flight

Differential diagnosis

- Antibiotics
- Parvovirus B19
- Enterovirus
- Human herpesvirus 6 (roseola)
Diagnosis

- Clinical signs and symptoms
- Laboratory
  - Serology – IgM and IgG
  - RT-PCR for measles RNA (nasopharyngeal, throat swab, urine) – Respiratory within 7 days, Urine within 10 days
- Genotyping

Question 1
- Does your facility require two doses of MMR vaccine or proof of immunity to measles for all employees?
  a) No
  b) Yes. For all employees, even those born before 1957.
  c) Yes. For all employees, with the exception of those born before 1957.
  d) I don’t know

Question 2
- Does your facility allow employees to opt out of MMR vaccination based on a personal belief exemption?
  a) Yes
  b) No
  c) I don’t know
Measles Testing

- Polymerase chain reaction is the recommended test for Measles virus detection.
- Specimen of choice is Nasopharyngeal swab.
- Other acceptable samples include throat swab, nasal aspirates, nasal swabs, urine and buccal swabs.
- IgM serology is performed on serum only.
- It is also recommended to test for Rubella IgM with Measles.
- Testing can be done at the North Dakota Department of Health Public Health Lab
  - PCR: $51, turn around time: 2 days
  - IgM: $26, Turn around time: 1 day
  - NDDoH recommends specimen be collected for both PCR and IgM testing.

Serologic testing

- IgM may diminish during 1st 72 hours after rash onset, but PCR should be collected as soon as possible.
  - Collect both at the same time as soon as possible.
- IgM persists for at least a month.
- False positives - non-measles infections, rheumatoid factor.
### Specimen Source

- **Serum specimen**
  - serologic detection of measles antibody

- **Nasopharyngeal, throat, nasal, and buccal swab, and nasal aspirate**
  - molecular determination or virus isolation

- **Urine**
  - molecular determination or virus isolation

### Serum Specimen Collection

- Collect 7-10 mL of blood in a serum separator tube (2 mL serum).
- Submit 2mL of serum for serological testing.
- Maintain specimen at refrigerator temperature (2-8°C).
- Transport on cold packs.

### Respiratory Specimen Collection

- Nasopharyngeal swab-preferred specimen
  - Use a sterile synthetic swab

- Nasopharyngeal aspirate
  - Throat swab
  - Use a sterile synthetic swab
  - **Do not use calcium alginate swabs or swabs with a wooden stick.**

- Buccal swab
  - Place specimen in viral transport media.
  - Maintain specimen at refrigerator temperature.
  - Transport on cold packs overnight.
Urine Specimen Collection

- First morning voided specimen during the first week after rash onset is ideal.
- Acceptable to collect up to 10 days after rash onset.
- Collect 50-100 ml urine in sterile leak proof container.
- Maintain specimen at refrigerator temperature (2-8°C).
- Transport specimen on cold packs and ship overnight.

Measles Virus IgM Antibody Testing

- Detection of IgM antibody in acute phase serum is the recommended test for rapid determination of acute measles.
- Acute serum specimen evaluated using an indirect immunofluorescent antibody (IFA) test to detect IgM antibody.
- Expected turnaround time is 1 day.
- In an unvaccinated individual, IgM antibody is generally detectable at time of rash onset and 1-2 months after.

Measles Virus IgG Antibody Testing

- Paired acute and convalescent serum testing for IgG antibody is done by IFA.
- Laboratory confirmation of measles with paired serum.
  - 4 fold increase in IgG titer
  - seroconversion from IgG negative to IgG positive
- Convalescent serum collected 2 to 4 weeks post onset of symptoms.
- IgG antibody can also be measured by IFA to demonstrate immunity or the presence of maternal antibody in infants < 15 mo.
Measles Virus Molecular Testing
- Measles Virus RNA detected by RT-PCR confirms infection.
- Throat swab, NP swab, nasal swab, buccal swab, or NP aspirate are all acceptable respiratory specimens.
- Urine specimen is acceptable.
- Expected turnaround time is 2 days.
- Optimal detection of measles RNA is from specimens collected within 4 days of rash onset.
- RNA detection may be successful as late as 10 to 14 days post rash onset.
- Failure to detect measles virus RNA does not rule out infection if the individual meets the clinical case definition.

Measles Virus Isolation
- Measles virus may be isolated from NP aspirate, NP swab, throat swab or urine to confirm measles infection.
- Samples should be collected in viral transport media and sent refrigerated, on ice packs, overnight.
- Expected turnaround time up to 14 days.
- Optimum specimen collection within 4 days of onset of rash.
- The virus may be isolated up to 10 days after rash onset.

Vaccine Interference with Laboratory Confirmation
- Neither IgM nor IgG antibody responses can distinguish measles disease from response to vaccination in a recently vaccinated individual (if vaccine given up to 45 days before rash onset).
- IgG antibody may develop a high titer soon after exposure or at rash onset in a vaccinated individual.
- A positive RT-PCR or isolation of virus may result from an individual vaccinated within 3 weeks of rash onset.
  - Genetic characterization on the RT-PCR product or isolate is required to differentiate between vaccine strain and wild type.
Genetic Characterization of Measles Virus
- Original respiratory or urine specimen, PCR product or isolates from laboratory confirmed cases of measles are submitted to our CDC vaccine preventable disease regional reference laboratory or CDC for genotype analysis.

Rubella Virus Testing
- Rubella IgM antibody testing by Enzyme Immunoassay (EIA) on acute phase serum
  - This test should be ordered along with Measles IgM antibody testing.
  - Expected turnaround time 1 day.
- Rubella molecular analysis referred to our CDC vaccine preventable disease regional reference laboratory or CDC.
  - RT-PCR for detection of Rubella virus RNA on throat swab, NP swab or aspirate in viral transport medium (please contact the NDDoH laboratory if other specimen types such as CSF require analysis).
  - Expected turnaround time 2 days.
  - If measles was suspected and testing was negative the sample may be referred for Rubella virus Genotyping on respiratory sample, RT-PCR product, or isolate.

Infection Control
Question 3

Does your facility have an infection control policy about how to handle individuals with rash illnesses in the waiting room?

a) Yes
b) No
c) I don’t know

Infectious Period

- 4 days before to 4 days after rash onset
- Extremely contagious
- Spread by airborne droplets—coughing, sneezing, breathing
- Can remain in the air or surfaces up to 2 hours after an infectious person has left a room
- Instruct patients to isolate themselves for four days after rash onset.
- Need to minimize measles transmission in your health care setting.

Vaccinate Healthcare workers

- Health care workers and anyone else working or volunteering in a health care facility should have adequate evidence of immunity to measles.
  - Although birth before 1957 is generally considered acceptable, health care providers should ideally still receive 2 doses of MMR vaccine or laboratory evidence of immunity.
  - Those born in or after 1957 should have 2 documented doses or MMR given 28 days apart or laboratory evidence of immunity.
- Without evidence of immunity:
  - Exclude from duty 5 days after 1st exposure to 21 days after last exposure.
  - Regardless of post exposure prophylaxis.
Post exposure prophylaxis

- Administer MMR within 72 hours of initial exposure to individuals without evidence of immunity
- May provide protection or modify the clinical course of disease
  - Unvaccinated contacts who receive a dose of MMR within 72 hours can return to childcare, school, or work
  - Cannot return to health care settings
- Vaccination should still be offered to unvaccinated exposed individuals even after 72 hours
- Administer IG within 6 days of exposure (high risk individuals-infants, pregnant women, immunocompromised)
  - Other factors will be considered before determining if someone who received IG within 6 days can return to work, childcare, or school
  - Cannot return to health care settings

Patients with Febrile Rash Illness

- Ask patients with febrile rash illness about a history of international travel, travel to Hennepin County, contact with foreign visitors, transit through an international airport, or possible exposure to a measles patient in the 3 weeks prior to symptom onset.
- Suspect measles in these patients
- During an outbreak, suspect measles in anyone with febrile rash illness or fever in combination with at least one of the following: cough, coryza, conjunctivitis, or otitis media.

Mask Suspect Measles Patients

- Patients with suspect measles should be masked immediately.
- If a surgical mask cannot be tolerated, place a blanket loosely over the head.
Remove from waiting room
- Suspect measles patients should be removed from waiting areas or any other common areas.
- Isolate suspect measles patients immediately in a negative pressure room.
- If negative pressure room is not available, place patient in a private room.
  - Keep door closed
  - Keep patient masked
  - Everyone in room should also be masked.
  - Keep door closed for at least 2 hours after the patient leaves the room.
  - Air handling system may need to be examined to identify potential exposures.

Must have documentation of immunity
- Only health care personnel with documentation of 2 doses of MMR should enter the room (or laboratory evidence of immunity).
- All health care personnel should be up to date on MMR vaccinations.
- Only visitors and other staff with two doses should be allowed in room if possible.

Measles in Health Care Facility
- All health care providers entering a patients room should use an N95 respirator regardless of evidence of immunity.
  - If not available, a surgical mask should be worn.
- Suspect measles cases should be scheduled for the end of the day if possible.
Notify

- Notify the NDDoH immediately (24/7) with any suspect measles cases.
  - Do not wait for lab confirmation.
  - 701.328.2378 or 1.800.472.2180
- Notify any location the patient is being referred to.
  - Do not refer patient unless proper infection control measures can be taken.
  - Patient must wear mask during transport.
- Instruct all suspect measles patients or exposed individuals to inform all health care providers of possible measles before seeking care.
- Document all staff and other patients who were in the area during the time the suspect measles patient was in the facility and for 2 hours after they have left.

Measles Vaccine and Epidemiology

Question 4

- Does your facility have a negative pressure room?
  
  a) Yes
  b) No
  c) I don’t know
Epidemiology
- Approximately 500,000 cases were reported annually in the United States.
  - The actual number of cases was estimated to be between 3-4 million annually.
- Approximately 48,000 people were hospitalized due to measles each year.
- Approximately 4,000 people suffered encephalitis.
- Approximately 400 to 500 people died each year.
- 2000: Eliminated from US-no endemic transmission for a year.
- 2001-2016: 37-220 cases/year
  - Exception of 2014: 667 cases

Measles in North Dakota 1922-2011

Source: NDDoH – Disease Control

Minnesota
- Minnesota is currently experiencing an outbreak
- 73 cases as of 06/01/2017
  - 64 Hennepin County
  - 1 Ramsey County
  - 1 Crow Wing County
  - 2 Le Sueur County
- Vaccination
  - 68 Confirmed unvaccinated
  - 2 had 1 dose of MMR
  - 3 had 2 doses of MMR
- Age
  - 70 in children (0-17 years)
  - 3 cases in adults
- 60 cases are Somali Minnesotan

http://www.health.state.mn.us/divs/idepc/diseases/measles/index.html
Anti-Vaccine Groups

- Prior to 2008
  - Somali Minnesota children had higher MMR coverage than non-Somali MN children
- Andrew Wakefield published paper on MMR and autism
- Local news story on higher autism rates in Somali Minnesota children than non-Somali Minnesota children
- Anti-vaccine groups began targeting this sensitive population
- Somali Minnesota children’s MMR coverage rates dropped
  - ≈ 42%

MMR Vaccine

- Very effective: 1 dose=93% efficacy, 2 doses=97% efficacy
- Routinely recommended for children
  - 1st dose at 12-15 months
  - 2nd dose at 4-6 years
- NDShh is not making any recommendations for accelerated MMR schedules for North Dakota residents at this time.
  - But everyone should be sure they are up-to-date on MMR!
- MDH is recommending the following get a second dose of MMR vaccine as soon as possible if they have not already and if it has been at least 28 days since their first dose of MMR:
  - Children 12 months and older in Hennepin, Ramsey, Crow Wing, and Le Sueur Counties
  - Somali Minnesotan children 12 months and older statewide
- MDH also stated health care providers may recommend an early second dose of MMR during routine appointment for all children in Minnesota.

MMR Vaccine-Adult Recommendations

- Adults born before 1957 are presumed to be immune to measles and do not need to receive MMR vaccine.
- Adults born in 1957 or later should have 1 dose of MMR vaccine unless they are high risk.
- High risk adults should receive 2 doses of MMR vaccine:
  - Health care workers
  - College students
  - International travelers
- There is no maximum age indication for MMR vaccine.
- Adults who received a killed or unknown measles vaccine prior to 1968 should be revaccinated with one dose of live vaccine.
- Ineffective measles vaccine available from 1963-1967
Travel Recommendations

- Adults should receive two doses if traveling internationally.
- Infants between 6 and 12 months who are traveling internationally should receive one dose of MMR prior to travel.
  - Dose will be considered invalid if:
    - Still need to receive one dose at 12-15 months and again at 4-6 years.
- *Annals of Internal Medicine*
  - 53% of travelers who went to travel clinic and needed measles vaccine did not get it before travel. Of these:
    - About ½ refused the vaccine,
    - 28% healthcare provider decided against it, and
    - Remaining ¼, barriers, such as vaccine unavailable at clinic.

State Vaccine

- The NDDoH supplies MMR vaccine at no cost for certain people.
- Vaccines For Children (VFC) Program-eligible children. These are children 18 and younger who are either:
  - Medicaid eligible
  - American Indian or Alaskan Native
  - Uninsured
  - Underinsured (have insurance, but it does not cover vaccinations)
  - Uninsured or underinsured adults

Vaccine Reaction vs. Disease

- Some individuals will experience a rash reaction after receiving the MMR vaccine.
  - Usually occurs seven to 12 days after vaccination.
  - May be indistinguishable from wild type measles rash.
- If there is concern about measles illness, PCR can differentiate between wild type measles and the vaccine.
  - Genotyping is required.
  - Testing requires more time than regular PCR.
North Dakota Requirements

- Two doses of MMR are required to attend grades kindergarten through twelfth in North Dakota.
- Children attending child cares must be age appropriately immunized with MMR in North Dakota.
- North Dakota allows medical and nonmedical vaccination exemptions.
- If there is a case of measles in a child care or school, students who are not adequately immunized against measles would be excluded for 21 days after the last case of measles.
  - Student would be excluded beginning on the fifth day after exposure.
  - Regardless of exemption.
  - Based on an incubation period of 7-21 days.

North Dakota MMR Coverage

- 2016-2017 Kindergarten Immunization Rate: 93.84%
- 3.13% of kindergarteners have a nonmedical exemption to at least one vaccine
- Seventh grade immunization rate: 97.21%
- According to the NDDoH School Immunization Survey
- MMR coverage rate for 19-35 month olds in North Dakota 2015: 92.8%
  - National Immunization Survey (NIS)

ND Kindergarten MMR Rates
ND Kindergarten MMR Rates 2016-2017

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**Reporting**
- Do not wait for laboratory results to report!
  - If you are suspecting measles in a patient, call the NDDoH immediately (24/7).
  - Timely reporting of suspected cases will allow the NDDoH to investigate cases and contacts and make recommendations to reduce transmission in the community.
  - Call 701.328.2378 or 1.800.472.2150
- Measles is a mandatory reportable condition according to North Dakota administrative code 33-08-01 and Statutory Authority NDCC 23-07-01.

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**Surveillance**
- NDDoH Disease Control will investigate every suspected case of measles.
- Gather information on case:
  - Whereabouts during infectious period
- Identify any potential contacts—recommend prophylaxis/exclusion or make them aware of exposure:
  - Four days before rash onset to four days after rash onset
- Determine measles susceptibility—vaccinated or history of disease
- Active monitoring of exposed individuals:
  - Before case was isolated:
    - Recombinant prophylaxis if indicated
    - Alert community of case visited public locations during infectious period
  - Include exposure to case two hours after the case left
- Exposed, susceptible individuals may be instructed to isolate themselves until the incubation period has passed or have developed disease.
  - Will be instructed to monitor for symptoms and call ahead to health care provider if symptoms develop
  - Active monitoring
After the presentation, questions may be sent to:

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For any immunization questions, call 701-228-2378 for the Immunization Program.