

Measles:
Public Health and
Health Care
Sharing Best Practices

Paul Hunter MD
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Paul Hunter, MD

Family Medicine, Clinical Practice 1992 - 2011

Underserved in Milwaukee & Rockford

Public Health & Academic Medicine 2009 -

City of Milwaukee Health Department

Immunizations, STIs, TB

University of Wisconsin

Community-based projects and research

Teaching public health and medical students

ACIP Voting Member 2016 - 2020

Disclosures

- I have directed my financial advisor to exclude vaccine manufacturers from my portfolio.
- Opinions expressed are NOT those of Immunize Milwaukee!, the University of Wisconsin, the City of Milwaukee Health Department, or the Advisory Committee on Immunization Practices (ACIP) of the United States Centers for Disease Control and Prevention.
- ACIP recommendations are standard of care and scientifically supported, but occasionally differ with indications for use approved by the United States Food and Drug Administration.

Measles - Learning Objectives

By the end of this presentation, participants will be able to

1. Recognize obvious signs and symptoms.
2. Recall the incubation and infectious periods.
3. Educate clinicians about tests to order on suspect cases.
4. Determine whether a person has evidence of immunity.
5. Recognize impact on vital public services of exposures within institutions such as hospitals or schools.
6. Strongly recommend vaccination.

Most Measles Cases in 25 Years

- In 2000, measles was eliminated from the United States
- In 2019, measles cases exceeded any entire year since 2000
- Most measles importations into the United States are from unvaccinated U.S. residents infected while traveling abroad
- Large active outbreaks: Ukraine, Israel, Philippines, and others
- “Most Measles Cases in 25 Years: Is This the End of Measles Elimination in the United States?” CDC webinar 5/21/19, archived at https://emergency.cdc.gov/coca/calls/2019/callinfo_052119.asp

Measles in America 2019

- As of 9/5/2019, 1,241 cases of measles in 31 states
- Of 839 measles cases as of 5/10/2019 ...
 - 621 (74%) in children,
 - 109 (13%) in infants aged <12 months
 - 738 (88%) cases in close-knit communities (NYC)
- Nationally, 95% of people are vaccinated for measles
 - but 1 in 12 children do NOT receive first dose on time
- www.cdc.gov/measles/cases-outbreaks.html

Outbreaks since elimination

- ~90% of cases are unvaccinated or unknown status
- Most unvaccinated because of personal or religious beliefs
- Increased cases from increased importation and more transmission after each imported case in pockets of unvaccinated peoples

Measles - Learning Objective 1

Recognize obvious signs & symptoms

- Fever
- "3 Cs":
 - Cough
 - Coryza (common cold: inflammation of the mucous membranes of the nose, throat, eyes)
 - Conjunctivitis (red, watery eyes).
- Maculopapular rash

Progression of signs & symptoms

Symptoms without rash (prodrome) = 2–4 days (range 1–7)

- Fever > 101°F, peaking up to 103–105°F
- Followed by cough, coryza (runny nose), or conjunctivitis.
- Koplik spots, 1–2 days before and after rash
 - Punctate blue-white spots on bright red background of buccal mucosa

www.cdc.gov/vaccines/pubs/pinkbook/downloads/meas.pdf

Measles rash

- Maculopapular, lasts 5–6 days
- Begins at hairline, then to face and upper neck
- Over 3 days proceeds downward and outward reaching hands and feet
- Lesions generally discrete, but confluent on upper body
- Initially, lesions blanch with pressure but by 3–4 days, most do not blanch
- Fades in same order, from head to extremities.

Measles complications

- Diarrhea 8%
- Otitis media 7%
- Pneumonia 6%
- Encephalitis 0.1%
- Seizures 0.7%
- Death 0.2%

- Based on 1985-1992 surveillance data

- www.cdc.gov/vaccines/pubs/pinkbook/downloads/meas.pdf

Measles - Learning Objective 2

Recall incubation & infectious periods

Incubation period

- from exposure to prodrome, averages 10–12 days.
- from exposure to rash averages 14 days (7–21 days)

Infectious period

- 4 days before to 4 days after rash onset
(Rash usually lasts 5–6 days)
- Most infectious during prodrome & first 3–4 days of rash

Measles transmission

- Transmission primarily via large respiratory droplets.
- Airborne transmission via aerosolized droplet nuclei in closed areas for up to 2 hours after a person with measles occupied the area
- > 90% people without immunity will get infected if exposed
- Asymptomatic carrier state has not been documented

Travel exposures

Have a high index of suspicion in patients who recently

- traveled internationally, or
- spent time as a domestic traveler at airports with numerous international flights (such as O'Hare), or
- had contact with members of communities with ongoing measles outbreaks (such as orthodox Jews in New York)

Measles - Learning Objective 3

Educate clinicians about tests to order

For suspect measles,

- Immediately call health department
- Collect nasopharyngeal and throat swabs for PCR test
- Consider blood for IgM and IgG titers
- Specimens to public health lab (WSLH or MHDL)
 - NOT to out-of-state reference lab
 - Need rapid turnaround & reporting of results to health dept.

If testing for measles, immediately call health department

- To report category I communicable diseases: measles, TB ...
- www.dhs.wisconsin.gov/disease/diseasereporting.htm
- Immediately call local health department
 - with jurisdiction for the residence of the patient
- City of Milwaukee Health Department:
 - Office hours 414-286-3624
 - After hours or weekends 414-286-2150

continued ... If testing for measles, immediately call health department

- Local health departments in Wisconsin:
 - www.dhs.wisconsin.gov/lh-depts/counties.htm
- For patients residing outside Wisconsin,
 - Call local health department for treating location
- After calling LHD, submit written report within 24 hours
 - Wisconsin Electronic Disease Surveillance System (WEDSS, www.dhs.wisconsin.gov/wiphin/wedss.htm)
 - Request WEDSS user ID and password by emailing DHSWEDSS@wisconsin.gov

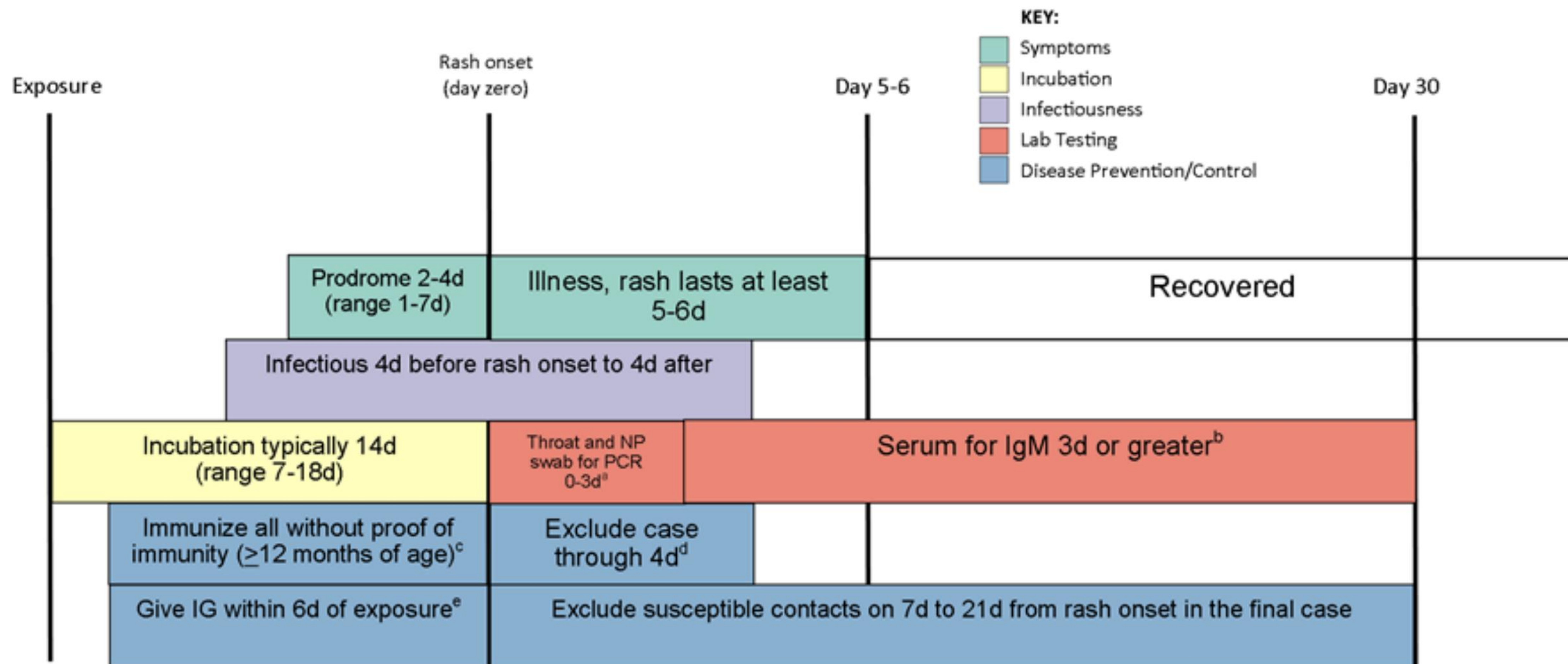
Collect throat and nasopharyngeal swabs as soon as measles suspected

- Success of detection depends on collection date
- Best on rash day 0 to day +3
 - or at the first clinical encounter with a suspected case
- Possible by
 - Cell culture thru rash day +10
 - RNA by RT-PCR thru rash day +14

Polymerase chain reaction (PCR) test

- Collect nasopharyngeal and throat swabs
 - Flocked, synthetic swabs
 - Polyester-, or Dacron-tipped swabs
 - NOT calcium alginate, NOT cotton tipped
 - Plastic or aluminum (NOT wood) shafts
 - Place both swabs in a single tube of viral transport medium

FIGURE I. MEASLES TIMELINE



Footnotes:

- a. Preferred timing for collecting throat and np swab is 0-3 days after rash onset but no later than 10 days. Urine can also be collected for PCR.
- b. IgM collected prior to day 3 may result in a false negative. Serum for IgG can be obtained ASAP after onset but is not helpful if a convalescent is not obtained 10-30 days after the initial.
- c. Proof of immunity: DOB prior to 1/1/1957 (not for healthcare worker), serologic proof, 1-2 doses of MMR vaccine. Available data suggest that measles vaccine, if given within 72 hours of exposure to susceptible individuals, will provide protection or disease modification in some cases.
- d. Count the day of rash onset as day zero. May return to normal activities on day 5.
- e. Give IG only if the person is immunocompromised, pregnant without evidence of immunity, or MMR is contraindicated.

Figure adapted from Michigan Department of Health and Human Services

Public Health Lab Testing

- CDC Collecting and Shipping Specimens for Suspected Measles Cases: www.cdc.gov/measles/lab-tools/rt-pcr.html
- WSLH Instructions Collection of Viral Specimens: www.slh.wisc.edu/wp-content/uploads/2017/01/Kit-18-Viral-Specimens_161228.doc
- WSLH measles tests available at state lab: www.slh.wisc.edu/wslhApps/RefMan/wslhSearch.php?searchTerm=measles&TEST_REFERENCE_ID=6496&submitIt=testDetail
- Requisition form for Milwaukee Health Department Lab: <https://city.milwaukee.gov/ImageLibrary/Groups/healthAuthors/LAB/PDFs/H-445MicrobiologyRequisition02.15.19FINAL.pdf>

Measles - Learning Objective 4

Determine evidence of immunity

Evidence of immunity consists of one of the following:

- Birth before 1/1/1957, if NOT healthcare personnel
- Blood titer showing immunity by level of IgG
- 1 dose of MMR vaccine, if NOT high risk
- 2 MMRs, at least 28 days apart, if high risk, including:
 - Students at post-high school education institutions
 - Healthcare personnel
 - International travelers

Table 1. Assessing Immunity to Measles among Exposed Persons, by Age

Age	Special Status	Acceptable Evidence of Immunity
Under 12 months	Any	Only laboratory evidence of immunity
1 to 4 years ¹	Any	1 valid MMR or laboratory evidence of immunity
5 to 18 years	Any	2 valid MMRs or laboratory evidence of immunity
Older than 18 years, born during or after 1957	Health care personnel College students International travelers	2 valid MMRs ² or laboratory evidence of immunity
	Others	1 valid MMR or laboratory evidence of immunity
Born before 1957	Health care personnel	2 valid MMRs ² or laboratory evidence of immunity
	Others	No evidence needed; all are considered immune

¹In certain circumstances two doses may be recommended.

²Health care personnel should have two doses of MMR pre-exposure in order to avoid exclusion following an exposure.

School Setting

Students, and adults born during or after 1957:

Previously unvaccinated exposed persons must be quarantined from day 7 through day 21 after exposure to the last case of measles, unless a dose of MMR vaccine was received within 72 hours of first exposure or IG was given within 6 days of first exposure (according to Wis. Stat. 252). Susceptible contacts who have already received one dose of MMR and received a second dose of MMR within 72 hours of exposure can be readmitted.

Table 2. Exclusion Criteria in the School Setting for Students (grades K-12) and Adults Born During or After 1957 who are Exposed to Measles:

Number of Pre-Exposure Doses of Measles-Containing Vaccine	Number of Doses of Measles-Containing Vaccine Received Within 72 Hours After Exposure	Total Number of Doses of Measles-Containing Vaccine Received	Exclude from School from Day 7 Through Day 21 Following Exposure?
0	0	0	Yes
0	1	1	No
1	0	1	Students Yes Adults ¹ No
1	1	2	No
2	0	2	No

¹A second dose is recommended for adults.

Documentation of immunity

Documentation of doses of vaccine must be

- Written on vaccination record or medical record or
- Retrieved electronically from a state or city registry
- Personal records or recollections are not sufficient

Revaccinate if:

- Vaccinated before the first birthday
- Vaccinated from 1963-1967 with unknown type of vaccine

Guidelines for diagnosis & management

For more information, including guidelines for patient evaluation, diagnosis, and management, visit:

- www.cdc.gov/measles/hcp/index.html
- “Information for health care professionals”

at www.dhs.wisconsin.gov/immunization/measles.htm

Measles - Learning Objective 5

Impact on vital public services

Medical and other services = vital response to outbreaks

- Non-immune staff can be furloughed for up to several weeks after potential exposure, so ...
- Update documentation of immunity to measles on all staff
- Vaccinate non-immune staff before an outbreak

Prevent airborne transmission

Because of airborne transmission up to 2 hours after ...

- Inform receiving facilities of incoming suspect cases
- Surgical mask on patient, N-95 masks on staff
- Airborne isolation rooms - maintenance
- Designate a path to evaluation and testing site

www.cdc.gov/infectioncontrol/guidelines/measles

Preventing exposures in health care

Consider evaluation and testing in ...

- patient's car in parking lot
- ambulance bay near emergency room

Limit people near evaluation and testing site

- delay to end of clinic day

Preventing transmission in public

Limiting movement in public spaces

Isolation

- Suspected or proven cases
- During infectious period, thru 4 days after rash

Quarantine

- Exposed, non-immune contact
- During incubation period, thru 21 days after exposure

Federal public health travel restriction

- Do Not Board (DNB)/Public Health Lookout (PHLO)

Communication - public health

- Goal: Public trust in recommendations
 - Identify threats. Motivate preventive action
 - Avoid compelling isolation & quarantine
- Coordinate messaging between
 - public health, health care, school
- Focused, small number of talking points
 - simple, straightforward, brief, clear

Measles - Learning Objective 6

Strongly recommend vaccination

- Most adults in the U.S. are immune to measles
- Vaccinating young children should be the focus of efforts to prevent the spread of measles
- Measles vaccination recommendation unchanged since 2013
- www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm

Table 1**Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger
United States, 2019**

These recommendations must be read with the Notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Table 1. To determine minimum intervals between doses, see the catch-up schedule (Table 2). School entry and adolescent vaccine age groups are shaded in gray.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13-15 yrs	16 yrs	17-18 yrs
Measles, mumps, rubella (MMR)					See Notes	← 1 st dose →					2 nd dose						

Measles Vaccination Recommendations

- 6 - 11 months: Extra dose for travelers
- 12 - 15 months: Routine dose #1
- 4 - 6 years: Routine dose #2
- Catch up any time with at least 28 days between doses
- Live vaccine: Do not give to pregnant women or immune compromised, including HIV with CD4 count < 200

Table 2**Recommended Adult Immunization Schedule by Medical Condition and Other Indications
United States, 2019**

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 count		Asplenia, complement deficiencies	End-stage renal disease, on hemodialysis	Heart or lung disease, alcoholism ¹	Chronic liver disease	Diabetes	Health care personnel ²	Men who have sex with men	
			<200	≥200								
MMR	CONTRAINDICATED			1 or 2 doses depending on indication								

Measles - Learning Objective 6

Share best practices

- Your name, title, clinic, health system
- Your role in diagnosing and isolating patients with measles
- Plans and policies at your clinic
- Assistance needed to make plans more robust
- Resources you can share with other clinics