CLINICAL GUIDELINE

# MEASLES: SYMPTOMATIC PATIENT

(Age < 25 years)

Children's MINNESOTA

**Aim:** To standardize management of patients with suspected/confirmed measles infection.

**Patient with confirmed measles OR symptoms suspicious for measles**
(see testing algorithm pages 5-6 for detail of whom to test)

- Mask patient + others present (e.g., caregiver, siblings)
- Isolate in an airborne infection isolation room (AIIR; negative pressure). If AIIR is not available, isolate in private room with door closed; patient (+ others) should remain masked.
- Order Airborne Precautions
- Notify Infection Prevention and Control (Amion or 952-260-9021 if at Children's MN); available 24/7

**Obtain history and perform exam**
Vaccine status (specify MMR), contacts/exposures (note A), travel history. Signs/symptoms (including date of rash onset), vital signs, hydration, respiratory status. Consider also alternate etiologies for illness (note B).
**Assess level of illness** (note C)

**Mild**
Symptomatic but not needing hospitalization for support.

- Obtain labs: "Measles for Suspected Disease (Rubeola) to MDH" in Cerner, "MEASLES PCR to MDH (UMSP)" in eCW.
- Give vitamin A (Appendix A, p 8-10).
- Evaluate/treat suspected coinfections based on symptoms (note D).

Discuss with parent/caregiver the need for exclusion from school/daycare for other household members who have not received at least one MMR. See follow-up notes on page 4.

**Moderate/Severe**
Signs or symptoms requiring hospital admission.
*Refer to Children's Minnesota ED for evaluation if in clinic (612-343-2121).*

- Consider ID consult if questions about clinical management. Other specialists if indicated (e.g., ophthalmology if significant eye findings beyond conjunctivitis).
- Obtain labs: "Measles for Suspected Disease (Rubeola) to MDH," CBC+diff, CRP, CMP, and serum to save (≥ 3 mL).
- Give vitamin A (Appendix A, p 8-10).
- Hydrate with IV fluids if indicated and/or consider NG tube if oral lesions preventing PO intake.
- 2-view CXR if respiratory symptoms to evaluate for infiltrate.
- Evaluate/treat suspected coinfections per symptoms (note D)
- Antibiotics per suspected sepsis orderset if sepsis is present.

## MEASLES SIGNS/SYMPTOMS

- **Prodrome (~2–4 days)**: fever, malaise, and anorexia, followed by conjunctivitis, coryza, and cough.
- **Enanthem (~48 hr before rash, NOT seen in all patients)**: Koplik spots which are 1–3 mm white/gray/bluish elevations with an erythematous base ("grains of salt on a red background") on buccal mucosa or palate.
- **Exanthem (2–4 days after fever)**: erythematous, maculopapular, blanching rash, which classically begins on the face and spreads down. Begin as blanching then don't blanch. Rash may not appear in immunocompromised patients.

** Fever beyond the third to fourth day of rash may suggest a measles-associated complication (note D).*

## EXCLUSION GUIDELINES

Patients **excluded** from this guideline:

- Pregnant patients

**NOTES A-D**
See page 2

# MEASLES: SYMPTOMATIC PATIENT

(Age < 25 years)



**Aim:** To standardize management of patients with suspected/confirmed measles infection.

## NOTE A

**Contact/exposure factors:** Incubation period for measles is 6 to 21 days (median 13 days). Period of contagiousness is ~5 days before the appearance of rash to ~4 days afterward.

## NOTE B

**Differential diagnosis of measles:** Broad, includes for example viruses (enteroviruses, adenovirus, COVID-19, etc), Rocky Mountain Spotted Fever, scarlet fever, toxic shock, meningococcemia, HSP, Kawasaki Disease, mono, MIS-C, etc.

## NOTE C

**Severity of illness levels**

- **Mild:** No respiratory distress or oxygen requirement; able to self-hydrate (may be after initial fluid support).
- **Moderate:** Requiring ongoing IVF support OR requiring respiratory support including low flow nasal cannula for hypoxia or HFNC for increased WOB.
- **Severe:** Hypoxia or work of breathing requiring non-invasive or invasive ventilation or concern that patient status is worsening on high flow nasal cannula OR SIRS/Sepsis/Shock OR rapidly worsening.

## NOTE D

Acute complications from measles

- **GI:** Diarrhea and stomatitis are common and may lead to poor PO and dehydration.
- **Neuro:** Encephalitis (~ day 5), acute disseminated encephalomyelitis (~week 2).
- **ENT/Resp:** Otitis media, tracheitis, croup, and respiratory distress are well-described. Measles pneumonia may cause symptoms and radiographic findings that overlap with bacterial pneumonia. However, co-infections may occur including with Strep pneumoniae, Strep pyogenes, H. influenzae, Staph aureus and viruses. Use antibiotics if strong suspicion for a pneumonic bacterial process due to both clinical exam and imaging findings. Utilize age appropriate guideline for work up and empiric treatment of suspected bacterial pneumonia ("Fever without obvious source infant 1-60 days," "Community acquired pneumonia guideline," or "Empiric antibiotic recs for patients ≥18 and <25 years old with common infections"). CXR findings for measles includes: mixed reticular opacities, air space consolidation, and hilar lymph node enlargement.
- **Ophthalmology:** Purulent conjunctivitis, keratitis, xerophthalmia (risk of blindness). Evaluate for pain, photophobia, erosion, or opacity.

**See Appendix A page 8-10** for Vitamin A dosing and administration

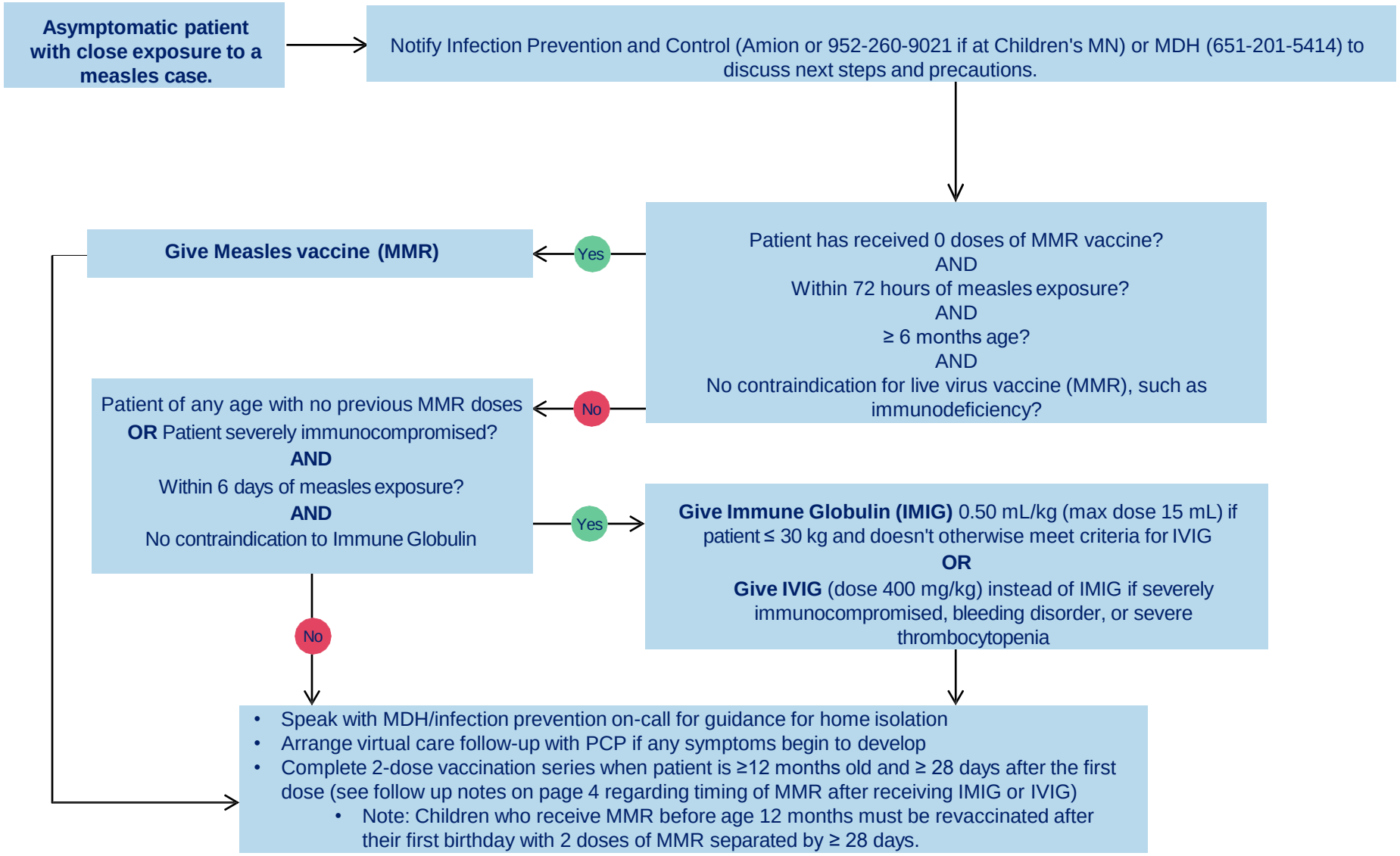
CLINICAL GUIDELINE

# MEASLES: ASYMPTOMATIC PATIENT WITH HIGH-RISK EXPOSURE

(Age < 25 years)

Children's MINNESOTA

**Aim:** To standardize management for asymptomatic patients with measles exposure.



**Aim:** To standardize management for asymptomatic patients with measles exposure.

## FOLLOW-UP NOTES

**Follow-up** should be with PCP within 1–2 days of diagnosis (if managed as outpatient) or discharge (if hospitalized).

- Consider use of virtual care visits if applicable.
- Assess hydration status. Consider use of Gastroenteritis "Oral Rehydration Therapy" guideline, with patient instructions available on Clinical Guidelines website including in multiple languages.
- Complete 2-dose MMR vaccination series ≥ 28 days after the first dose if not yet completed. See note below regarding timing of MMR after receiving IMIG or IVIG.

**Later complications from measles**

- **Neuro:** Acute disseminated encephalomyelitis (~ week 2) and subacute sclerosing panencephalitis (SSPE, years later). SSPE is a rare, but fatal degenerative CNS disease characterized by behavioral and intellectual deterioration and seizures that generally develop 7 to 10 years after measles infection.
- **Immune "amnesia":** Patients with measles are at higher risk for infectious diseases in the 2–4 years after measles infection, including for diseases they may have been previously immunized against or immune to. Maintain a lower threshold for testing/treating and refer to ID/immunology if there are concerns.

**If patient received IVIG or IMIG**

- No live-virus vaccines until 8 months after IVIG (recommendation based on receipt of 400 mg/kg dosing- timing may be variable if a different dose of IVIG was given, for example if patient was already on subcutaneous IG for another indication) or until 6 months after IMIG. *Note, patients at high risk of exposure may receive live-virus vaccines sooner and then should be reimmunized after 11 months if they have an inadequate serological response.*
- Risks of IVIG including: hemolytic anemia, aseptic meningitis.
- Most patients who receive IMIG have some discomfort and temporary mild swelling at the injection site.
- Note for patients weighing > 30 kg (66 lbs), IVIG is recommended over IMIG as they are unlikely to receive an effective dose via IMIG.

**Post-exposure considerations (per CDC.gov)**

- If a health care provider without evidence of immunity is exposed to measles, MMR vaccine should be given within 72 hours, or IG should be given within 6 days when available. Exclude healthcare personnel without evidence of immunity from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.
- Infected people should be isolated for four days after they develop a rash; airborne precautions should be followed in healthcare settings.
- People without evidence of immunity who do not receive appropriate post-exposure prophylaxis within the appropriate timeframe should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles.

# MEASLES TESTING ALGORITHM

Children's MINNESOTA

**Aim:** To guide appropriate testing for measles.

**Does the patient have:**
1. **Fever AND known exposure[3] (notified by childcare/school, public health)**

Yes → **IMMEDIATELY ENSURE THE FOLLOWING, IF NOT YET COMPLETED:**
- Mask patient (family members with symptoms should mask)
- Isolate in an airborne infection isolation room[6] (AIIR; negative pressure)
  - If AIIR is not available, isolate in private room with door closed; patient should remain masked
- Order Airborne Precautions
- Notify Infection Prevention and Control (952-260-9021); available 24/7
- Order measles test[7]

No ↓

Does the patient have:
1. Fever[1] **AND** rash[2]
   **AND**
2. Cough **OR** coryza **OR** conjunctivitis

Yes → 
1. Does the patient have at least one risk factor for measles?
   a. Known exposure to measles[3]
   b. History of international travel[4] within the previous 30 days
   c. History of domestic travel to areas of concern[5] within the previous 30 days
   d. History of domestic travel through an international airport within the previous 30 days
   e. Contact with an international visitor

**OR**

2. Is there a high degree of clinical suspicion for measles?

Yes → Assess Measles, Mumps and Rubella (MMR) immunization status.

- **Any** *documented* doses of MMR. → Determine *date* of most recent MMR.
  - MMR administered 10-14 days prior to symptom onset → Does patient appear toxic?
    - Yes → IMMEDIATELY ENSURE THE FOLLOWING, IF NOT YET COMPLETED:
    - No → **Do not test.** Timeline and symptoms are consistent with vaccine-associated rash illness.
  - MMR administered <10 days or >14 days prior to symptom onset
- **0** *documented* doses of MMR.

No → **Do not test.** Patient does not meet measles case definitions. For patients with a history of international travel, continue to assess for other travel-associated infectious diseases.

**NOTES 1–7**
See page 6

# MEASLES TESTING ALGORITHM

**Aim:** To guide appropriate testing for measles.

## NOTE 1
- Fever must be present at the same time as the rash, even if fever is subjective.

## NOTE 2
- Rash should start on the head or neck, if rash origin is known.

## NOTE 3
- Consider the patient to have a known exposure if the patient/family reports being notified by a healthcare facility or health department that they were exposed to a confirmed measles case. Consider the patient to have a possible exposure if the patient/family reports contact with a measles case.

## NOTE 4
- Whether or not a patient meets a measles case definition, follow Screening for Travel-Associated Infectious Diseases for all patients with a history of international travel within the past 30 days.

## NOTE 5
- Consult with Infection Prevention and Control (Amion or 952-260-9021, if at Children's MN; available 24/7) or compare patient's reported domestic travel to locations of current U.S. measles cases and outbreaks.

## NOTE 6
- To determine locations of airborne infection isolation rooms (AIIRs; negative pressure), refer to Airborne Infection Isolation (AII) and Protective Environment (PE) Patient Rooms.
- If an AIIR is not immediately available, place the patient (and those accompanying the patient, e.g., caregiver, siblings) in a regular room. The patient and any others with symptoms should mask. Place a portable HEPA filter unit (obtained from MESA) inside the room, and keep the door closed. Make arrangements to move the patient to an AIIR as soon as possible.

## NOTE 7
- Refer to the "Measles Lab Testing Instructions" and order "Measles for Suspected Disease (Rubeola) to MDH"

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- National Foundation for Infectious Diseases Call to Action: vitamin A for the Management of Measles in the United States.
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**Current Children's Minnesota Measles Guideline Workgroup:** Berg (Infection Prevention), Kalaskar (ID), Pozos (Immunology), Sznewajs (Hospital Medicine), Sicoli (ED), Chawla (Primary Care), Hoff (Pharmacy), Bunzli (Pharmacy), Montesinos (CPDP), Brunsberg (Hospital Medicine/Quality)

Original versions of guidelines developed by: Hester, Stinchfield

# MEASLES – APPENDIX
(Age < 25 years)



**Aim:** To provide guidance on the administration of vitamin A capsules to patients unable to swallow capsules

## APPENDIX A:

### Vitamin A for the Treatment of Measles: Dosing and Administration Instructions for Pharmacy/Providers

Vitamin A is recommended for all patients with measles regardless of nutritional status or country of origin (unless extreme vitamin A supplementation has recently been given). As measles can decrease serum vitamin A (retinol) levels, checking levels before treatment is not recommended. When given at the recommended doses, vitamin A may help reduce the severity of illness in patients with measles. It will not prevent or cure measles. Vitamin A may be prescribed **daily for up to 2 days*** for supplementation.

Dose is dependent on age and given **enterally.** See dosing guidelines below. *Unfortunately, vitamin A is only available in softgel capsules. Prescribe and administer as follows (see following pages as well)·*

| | Patient is being admitted | Patient is not being admitted |
|---|---|---|
| **Able to swallow pills** (note this may be up to 20 capsules to achieve required dose) | *Prescribe two doses per dosing guidelines below* | *Prescribe two doses per dosing guidelines below* |
| **Unable to swallow pills** | *Prescribe two doses per dosing guidelines below. -Administer using syringe technique described below* | *Prescribe one dose per dosing guidelines below. -Administer one dose in clinic/ED using syringe technique described below* |

**Dosing:**

Infants < 6 months: 50,000 units/day (15,000 mcg RAE/day) enteral for 2 days

Infants 6 to 11 months: 100,000 units/day (30,000 mcg RAE/day) enteral 2 days

Infants ≥ 12 months and children: 200,000 units/day (60,000 mcg RAE/day) enteral for 2 days

* If severe malnutrition or ophthalmologic evidence of vitamin A deficiency is present, administer a third dose 2–4 weeks after the 2nd dose.

Conversion factors *(All calculations based on the prescribing and utilization of vitamin A 10,000 international units/capsule. Please adjust calculation if different strength of capsule is prescribed. Vitamin A 10,000 international units/capsule is the only strength available at Children's Minnesota inpatient pharmacy.)*

1 capsule = 3,000 mcg = 10,000 units

Calculation for number of capsules needed:

$$Number\ of\ capsules = \frac{Desired\ Dose\ (mcg)}{3000\ mcg/capsule}$$

**Example:**

1-year-old patient: 200,000 units/day (60,000 mcg)

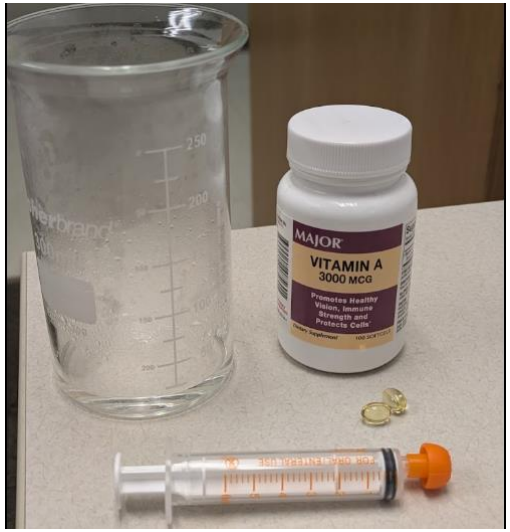
$Number\ of\ capsules = \frac{60{,}000\ mcg}{3{,}000\ mcg}$ = 20 Capsules

# MEASLES – APPENDIX
(Age < 25 years)



**Aim:** To provide guidance on the administration of vitamin A capsules to patients unable to swallow capsules

## APPENDIX A:




Administration for pharmacy/healthcare providers:

1. Gather the appropriate supplies needed:
   - 6mL enteral syringe(s) and cap(s): 1 syringe for every 2 capsules
   - Patient's dose of vitamin A
   - Warm water (approximately 2-3 mL per syringe)

2. Remove the plunger from the syringe, place the cap on the tip of the syringe and place up to 2 capsules into the syringe at the plunger entry site

3. Place 2-3 mL of warm water into the syringe through the plunger entry site, place plunger back into syringe, invert syringe vertically and remove the cap.

*Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.*

# MEASLES – APPENDIX
(Age < 25 years)



**Aim:** To provide guidance on the administration of vitamin A capsules to patients unable to swallow capsules

## APPENDIX A:

4. Push the plunger up slowly to push all of the air out of the top of the syringe. Stop and re-cap the syringe as soon as the water is up to the tip of the syringe and all air has been removed.


5. Push the plunger up slowly to push all of the air out of the top of the syringe. Stop and re-cap the syringe as soon as the water is up to the tip and all air has been removed.
6. Let the syringe sit for **5 minutes or longer**, allowing the capsules to soften and water to cool down.
7. Transfer the liquid from the syringe into a small cup. Discard the empty gelatin capsules, as they may exit the syringe into the small cup, as well.
8. A small amount of the capsule may remain in the syringe and may be discarded. If the empty gelatin capsule(s) exit the syringe and end up in the small cup with the liquid, remove the capsules and discard them.
9. Discard all syringes used.
10. OK to mix the Vitamin A liquid with a small amount of juice or flavoring agent. Reach out to your decentral pharmacist if a small amount of cherry syrup is desired to mix the Vitamin A with.

Administration guidance developed from Dayton's Children's Hospital.

Process tested and confirmed by Jill Johnson, PharmD and Mike Raschka, PharmD