This guidance document is designed to support the clinical management of measles cases at all levels of the health-care system in the Pacific

Disclaimer: Some of the content of this handout is drawn from the Management of a Measles Epidemic Guideline developed by Médecins Sans Frontières. Please refer to www.medicalguidelines.msf.org to access the guide. MSF did not endorse the content of this handout and is not responsible for, and expressly disclaims, any and all liability for any direct, indirect, and/or consequential damages as a result of, and/or, in connection with the handout and the use which may be made of it.
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## Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>+</td>
<td>add</td>
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<tr>
<td>AIIR</td>
<td>airborne infection isolation room</td>
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<tr>
<td>IgG</td>
<td>immunoglobulin G</td>
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<tr>
<td>IgM</td>
<td>immunoglobulin M</td>
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<tr>
<td>IM</td>
<td>intramuscular</td>
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<tr>
<td>IU</td>
<td>international units</td>
</tr>
<tr>
<td>IV</td>
<td>intravenous</td>
</tr>
<tr>
<td>MCV</td>
<td>measles-containing vaccine</td>
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<tr>
<td>mo</td>
<td>months</td>
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<tr>
<td>NHIG</td>
<td>normal human immunoglobulin</td>
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<tr>
<td>PCR</td>
<td>polymerase chain reaction</td>
</tr>
<tr>
<td>RNA</td>
<td>ribonucleic acid</td>
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</table>
**Background**

Since 2017, a global resurgence of measles cases has been affecting all regions of the world. In global immunisation surveys, coverage for the second dose of measles-containing vaccine (MCV2) was 69%, with significant variability between regions. In the Asia Pacific region and Pacific rim, outbreaks and clusters of measles cases are being reported from countries where measles has been eliminated, including Australia, Japan, New Zealand, Republic of Korea and the United States of America, as well as higher incidence in endemic countries such as Lao PDR, Malaysia, the Philippines, Thailand and Viet Nam.

As of 17 December 2019, Samoa, Tonga, Fiji and American Samoa have reported measles outbreaks (i.e. locally acquired cases) following measles introduction. The outbreaks in Samoa, Tonga and Fiji are caused by the D8 strain (genotype) of measles virus which is circulating in the Asia Pacific region. Achieving and maintaining immunisation coverage of 95% or higher with two doses of measles-containing vaccine is the most effective public health measures to prevent measles outbreaks and achieve measles elimination. Measles vaccine coverage varies in Pacific island countries and areas, ranging from 31% in Samoa prior to the onset of the 2019 outbreak to 99% in the Cook Islands, Nauru and Niue. Measles cases in the current Pacific outbreaks have occurred because of importation by people infected while in other countries with measles outbreaks. Low herd immunity and pervasive travel with mass gatherings in the region have fuelled transmission and spread of the measles virus.

**Clinical signs and symptoms of measles**

Measles is a highly contagious acute viral infection. The virus is transmitted by aerosols (inhalation of microdroplets emitted by an infected person) and direct contact with contaminated fomites (e.g. toys, tissues, patient charts, BP cuffs) and surfaces (e.g. tables, door knobs, bed frames). Measles mainly affects children under 5 years of age and can be prevented by vaccination.

The incubation period from exposure to onset of fever is ~10 days (14 days until the rash appears) but can range from 7-18 days.

*Any patient with a fever and a non-vesicular rash should be strongly suspected as having measles, especially in the context of an outbreak.* If the patient also has symptoms of cough, red inflamed eyes (conjunctivitis), runny nose (coryza) or Koplik spots, think measles.

**Signs and symptoms appearing before rash is seen - prodromal phase** (2 to 4 days)
• High fever (>38°C) associated with cough, runny nose, conjunctivitis (red eyes) and watery eyes (tearing eyes).
• Koplik spots: small white-blue spots are sometimes visible in the inside of the cheek near the upper molars. This is a classic sign (pathognomonic) of measles but may not always be present.

**The measles rash** (4 to 6 days)
• On average 3 days after the onset of fever a red rash appears that is not vesicular (i.e. unlike chickenpox), painful or itchy, typically starting on the head and gradually descending to the lower body over three or four days. The rash lasts for under a week.
• Patients are infectious from 4 days before and 4 days after the appearance of rash.

**Recovery phase**
• There can be significant peeling of the skin after the rash disappears. Peeling (desquamation) can be intensive for 1 to 2 weeks.
Clinical triage algorithm for measles

Measles management guidelines for health facilities

All health facility staff should be immunized

Vaccinate health facility staff who cannot provide evidence of previous infection or receiving two doses of measles-containing vaccine.

ASSESS

Does the case meet the case definition?

A patient of any age who is experiencing BOTH:
- Fever 38°C (100.6°F) or higher at the time of rash onset.
- Maculopapular rash (raised red, non-blistering, not itchy).

AND one or more of the following:
- Koplik spots (small white spots on the mucous of the mouth, immediately behind the upper 1st and 2nd molars. This symptom is specific to measles.)
- Cough.
- Conjunctivitis (red, watery eyes).

CHECK TRAVEL HISTORY:
Suspect measles if the case has recently travelled, or been in contact with someone who has recently travelled, to a country experiencing a measles outbreak.

Suspect measles even in absence of Koplik spots (papulon) or cough or conjunctivitis (specific).

IMPORTANT: Measles can occur in previously vaccinated individuals. Manage all clinically compatible cases as measles until laboratory test results are available.

SUSPECTED MEASLES CASE

If possible, assess suspected cases in their home to reduce transmission.

IMPORTANT:
- MINIMIZE MEASLES transmission in the health facility
  - If a case is suspected, take immediate steps to minimize transmission within the health facility:
    - Health workers and suspected cases should apply respiratory and contact precautions (N95 mask for health workers and surgical masks for patients).
    - Conduct the consultation in a single, well ventilated room that can be left vacant for at least 30 minutes afterwards.

PREVENT

Definition of a contact

Anyone who has shared the same air with the suspected case whilst they were infectious (e.g. household, health facility, bus, plane). Cases are infectious from 4 days prior to the onset of rash until 4 days after the rash erupts.

In the health facility

Contact tracing: Conduct contact tracing in the health facility (patients, staff, visitors) and provide information on measles to exposed individuals. Record and report contact details of exposed contacts to the public health unit.

Post-exposure vaccination: Vaccinate contacts within 72 hours of first exposure, if they cannot provide evidence of previous measles infection or receiving two doses of measles-containing vaccine.

Stay alert: Provide contacts information about measles and ask them to stay alert for signs and symptoms. Ask individuals to immediately call the health facility if they suspect measles, so they can be assessed at home or brought upon arrival at the facility. Suspected cases should avoid public spaces and public transport.

NOTIFY

Immediately report

Report the suspected case to your public health unit: [enter health unit information]

TEST

Immediately take:
- Blood including dried blood spot (lymph testing). Collect it 6-18 days after rash onset.
- AND either
  - Nose or throat aspirate/secret (PCR and genotyping). Collect within first 5 days of rash onset.
  - OR
  - Urine (measles virus isolation and PCR). Collect within 2 weeks of rash onset.
- Send samples for urgent testing.

MANAGE

Isolate immediately in a well-ventilated single room:
- Health workers and suspected cases should apply respiratory and contact precautions (N95 mask for health workers and surgical masks for patients).
- Obtain the immunisation history from the case, parent or guardian and check the child health record card (if available).
- Provide supportive treatment and treatment for complications.
- Provide paracetamol/acetaminophen/Suprophene for fever. Don’t provide aspirin.
- Consider providing vitamin A supplementation for patients at risk of vitamin A deficiency, including malnourished individuals, to reduce the risk of blindness.

Measles Isolation:
- If a single room is unavailable, suspected cases can share the same room. The rooms ventilation should direct air outside of the building and away from other patient areas.

**Vitamin A Administration and Dosage:**
- Administration early immediately on diagnosis and repeated the next day.
- Dose of 0.250 000 IU is given to infants 6-11 months of age.
- Dose of 0.100 000 IU is given to infants 0-5 months of age.
- Dose of 0.200 000 IU is given to children 6-11 months of age.

**Within 72 hours**

For further information and support, contact: [include provincial public health unit info]
Differential diagnosis

- Will depend on the local epidemiology of acute fever and rash illness and may include: rubella (accompanied by posterior cervical lymphadenopathy and/or arthralgia), arbovirus infections (dengue, Zika, chikungunya), erythema infectiosum (parvovirus B19 infection), roseola infantum (human herpesvirus 6 (HHV-6) which causes a fleeting rash involving mainly the trunk), infectious mononucleosis (Epstein-Barr virus), scarlet fever, certain rickettsial infection, epidemic typhus, drug eruptions etc.

- During a measles outbreak, measles should be suspected in all non-immune persons presenting with the measles prodrome (before the rash appears), investigated and managed accordingly. Always take a detailed exposure history to determine whether the suspected case of measles is epidemiologically linked to a confirmed case of measles or to an outbreak area.

- Measles can present without fever (7% of cases) or rash (15-18%) and atypical presentations can occur in people who have partial immunity to measles.

Complications

- Most measles cases (~75%) develop at least one complication. In children under 5 years, respiratory and ear, nose and throat complications are the most common complication of measles. The most common immediate causes of death are pneumonia and dehydration.
  - Acute otitis media occurs in 5-15% of measles cases
  - Pneumonia (usually bacterial e.g. pneumococcal infection) occurs in 5-10% of patients with measles
  - Acute laryngotracheobronchitis (croup) is a potential complication in children, usually presenting as a moderate, self-limiting disease lasting 2 to 5 days. Children with croup need careful monitoring because their respiratory status can deteriorate rapidly.
  - Severe inflammation of the eye, including with risk of blindness (purulent conjunctivitis, keratitis, xerophthalmia). The most common eye complications are bacterial infections and xerophthalmia due to vitamin A deficiency
  - Inflammation of the mouth and gastrointestinal tract, including potentially severe diarrhoea causing dehydration
  - Neurological complications including seizures and encephalitis. Measles encephalitis occurs in 1-2 per 1000 measles cases
  - Acute malnutrition induced or aggravated by measles (post-measles period).

- Those most at risk of developing severe illness and complications of measles are:
  - Children below the age of 5 years, especially if malnourished
  - Adults above the age of 20 years
  - Pregnant women
  - Immunocompromised people of all ages, such as those with leukaemia and other malignancies, people living with HIV, and people on chemotherapy, radiotherapy and/or taking high dose steroids.
Actions to be taken

Children under 5 years of age are particularly prone to measles complications. Hospitalise if the patient has any of the signs and symptoms of severe complications:

- Inability to drink or breastfeed
- Deep or extensive mouth ulcers
- Dehydration or malnutrition
- Confusion, difficulty waking, unconsciousness or convulsions
- Signs and symptoms of respiratory distress, including hypoxia (SpO₂ <90%), rapid breathing (>60/min for infants 0-2 months of age; >50/min for infants 2-12 mo; >40/min for children 1-5 years), intercostal retractions, stridor, cyanosis, croup¹
- Severe eye complications (e.g. vision changes, eye pain, photophobia, corneal erosion or corneal opacity)
- Severe acute otitis media with pus drainage. (Depending on the duration of illness, otitis media may be manageable as an outpatient)
- Mastoiditis

Patients with measles should be isolated from non-immune staff, visitors and patients. See Annex 1 for specific guidance.

Treat as an outpatient if the child/patient has no major complications

- Pneumonia without warning signs of respiratory distress
- Non-severe otitis media ear inflammation
- Conjunctivitis without warning signs of severe inflammation and corneal damage
- Diarrhoea without dehydration
- Oral thrush (candidiasis) not affecting ability to eat, drink, or breastfeed
- If in doubt, keep the child under observation for a few hours before releasing to home care.

Patients not requiring hospitalisation for major complications should be kept at home and away from public places (e.g. school, public transit) until 4 days after the onset of the rash. They should avoid contact with any unvaccinated family/household members, including infants below age 6 mo, pregnant women and visitors.

Diagnosis and laboratory testing

Healthcare providers should report to their local health authority within 24 hours, any patient presenting with acute rash and fever with clinically compatible signs and symptoms of measles. Strongly suspect measles if the patient gives a history of travel to, or contact with a person from an affected area within the 18 days before symptom onset and is susceptible to measles (has received <2 doses of measles-containing vaccine and unlikely to be immune from prior measles infection).

Laboratory diagnosis is important in confirming an outbreak of measles. During an outbreak it is usually only necessary to send specimens from the first 5 cases of fever and rash.

¹ Symptoms of croup (cry or hoarse voice, respiratory discomfort, shrill breathing noise (respiratory stridor) characteristic cough, “barking”) are related to inflammation and narrowing of the larynx. Croup is considered benign if the stridor appears when the child is agitated or weeps but disappears when the child calms down. However, the child must be monitored because respiratory problems can quickly deteriorate. The croup is severe when the stridor persists when the child is resting (it is continuous) or is accompanied by respiratory distress.
Laboratory diagnosis methods for confirming measles are the following:
- Antibody investigation - positive IgM antibody or seroconversion to IgG
- Molecular investigation - detection of measles RNA and genotyping
- Virus isolation - isolation of measles virus from clinical specimen.

Antibody testing in serum is the most frequently used test to confirm acute measles infection. Healthcare workers should obtain a serum sample from patients suspected of measles at first contact.

A nasopharyngeal swab for molecular analysis can be conducted to determine the genotype of the measles virus. Genotyping is used to map transmission pathways of measles viruses.

Immediately take:
- Blood including dried blood spot (IgM testing). Collect 4-28 days after rash onset
  AND either
  - Nose or throat aspirate/swab (PCR and genotyping). Collect within the first 5 days following rash onset
  OR
  - Urine (measles virus isolation and PCR). Collect within 2 weeks of rash onset.

Clinical management

Symptomatic and preventive treatment
- There are no specific treatments for measles infection, and clinical care is focused on preventing and treating complications.
- Provide Vitamin A supplementation to reduce the risk of severe complications including blindness – one dose immediately on diagnosis and a second dose the next day
  - dose of 50 000 IU is given to infants <6 mo of age
  - dose of 100 000 IU to infants 6-11 mo of age
  - dose of 200 000 IU to children ≥12 mo of age
- Treat fever with paracetamol and sponge baths
- Encourage fluid intake and use oral rehydration salts or intravenous fluids depending on signs/degree of dehydration, particularly if there is severe diarrhoea
- In severe cases of stomatitis, fluid intake can be maintained through a gastric tube
- Increase the frequency of feedings or meals (every 2 to 3 hours)
- Continue breastfeeding
- Encourage frequent nose blowing to keep the airways clear
- Use fresh water to keep the eyes clean and saline water for mouthwash
- In children under 5 years of age: amoxicillin orally for 5 days as a preventive measure (reduction of respiratory and eye secondary infections).

Treatment of measles with complications

The following guidance should be used in the context of local treatment guidelines, formulary and availability of medications, as well as other considerations like antimicrobial resistance patterns.
Table 1 – Treatment of complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
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</table>
| Severe pneumonia                                  | Give ceftriaxone IV/IM + cloxacillin IV for 3 days; then continue with amoxicillin/clavulanic acid orally if clinically improved to complete 7-10 days of treatment  
+ Oxygen if cyanosis or $O_2$ saturation $<90%$  
+ Salbutamol if expiratory wheezing and/or sibilant rales on auscultation  
If staphylococcal pneumonia is suspected: cloxacillin IV + gentamicin IM |
| Uncomplicated pneumonia or acute otitis media (AOM) | Give amoxicillin orally for 5 days for uncomplicated pneumonia and AOM  
Use ciprofloxacin ear drops for chronic otitis media with pus |
| Croup                                             | Admit and monitor; keep the child calm. Agitation and crying worsen croup symptoms.  
Severe and life-threatening croup: dexamethasone IM (0.6mg/kg single dose)  
+ Nebulised adrenaline 1 mg/ml  
Less severe cases can be managed with corticosteroids alone  
+ Oxygen if cyanosed  
+ Continue intensive surveillance until symptoms resolve. |
| Dehydration                                       | Rehydrate orally or intravenously depending on severity |
| Oral candidiasis                                  | Treat with nystatin tablets, miconazole oral gel |
| Purulent conjunctivitis                           | Ophthalmic tetracycline 1% for 7 days. Clean eyes with clean water |
| Keratitis/ Keratoconjunctivitis                   | Corneal ulceration or opacity  
Ophthalmic tetracycline 1% twice a day for 7 days  
+ Retinol orally single dose on days 1, 2 and 8  
+ Eye patch to protect the eye and paracetamol to treat the pain  
**Do not treat** with local corticosteroids |
| Xerophthalmia                                     | Treat in the early stages to avoid serious complications.  
• Hemeralopia (blindness in dim light) is an early sign - the child cannot see when the light is dim, may bump into objects and/or show decreased mobility. Bitot’s spots: greyish foamy patches on the bulbar conjunctiva, usually in both eyes appear later (specific sign, however not always present).  
• Corneal xerosis: cornea appears dry and dull  
If ulcerations affect less than a third of the cornea and the pupil is spared, vision can be retained. It is also necessary to treat the irreversible stage of keratomalacia, to save the other eye and the patient’s life.  
**Retinol (vitamin A) oral**  
Corneal damage is a medical emergency. Give immediate treatment with retinol.  
In children and adults (except for pregnant women), the treatment schedule is the same regardless of the stage of the disease -  
• Children 6 - 12 mo or under 8 kg: 100,000 IU once a day on days 1, 2 and 8  
• Children >12 mo or over 8 kg: 200,000 IU once a day on days 1, 2 and 8  
• Adults: 200,000 IU once a day on days 1, 2 and 8  
Vitamin A deficiency is exceptional in children under 6 months of age who are breastfed. If necessary 50,000 IU once a day on days 1, 2 and 8.  
In pregnant women, treatment varies according to the stage of illness: |
• Hemeralopia or Bitot’s spots: 10,000 IU once daily or 25,000 IU once weekly for at least 4 weeks. Do not exceed indicated doses (risk of foetal malformations).  
• If the cornea is affected, the risk of blindness outweighs teratogenic risk. Administer 200,000 IU once daily on days 1, 2 and 8.  
+ Treat or prevent secondary bacterial infections with 1% tetracycline eye ointment, one application 2 times daily (do not apply eye drops containing corticosteroids) and protect the eye with an eye-pad after each application.

Febrile convulsions

| Protect from trauma, ensure a clear airway, place in the decubitus position and loosen clothes. Most seizures resolve spontaneously and quickly. The administration of an anticonvulsant is usually not needed.  
| If a generalised seizure lasts more than 5 minutes, administer diazepam.  
| Children: 0.5 mg/kg intrarectal preferably without exceeding 10 mg.  
| Slow IV administration (0.3 mg/kg in 2 to 3 minutes) with ventilatory assistance equipment at hand (Ambu and mask).  
| Adult: 10 mg intrarectal or slow IV.

Note: Please see detailed treatment and dose recommendations in Annex 2

Contact management

Vaccination

• Two doses of measles-containing vaccine are protective. Follow the national immunisation schedule.  
• Maintain a minimum interval of 4 weeks between doses.  
• When there is a high risk of infection (population grouping, epidemic, malnutrition, child born to HIV-infected mothers, etc.), administer an additional zero dose* as early as 6 months of age. Infants given a zero (early) dose of measles vaccine, i.e. before age 12 mo, should receive two more doses in accordance with the routine schedule for your country. The early dose and the next dose should be given at least 4 weeks apart.  
• Children under the age of 15 who are not immunised with two doses of a measles-containing vaccine should be vaccinated during contact with a health service. Find out about national recommendations.  
• Decisions about whether post-exposure prophylaxis is needed should be made with information of the age groups most likely to be immune through childhood infection with measles.

Post-exposure management of measles case contacts

Any contacts exposed to a case of measles 4 days before and 4 days after the rash onset, who are not immune and are aged 6 months and over, should be given a dose of MCV within 72h of the exposure.

Contacts who are not eligible for measles vaccine due to age <6 mo, pregnancy or medical conditions contraindicating measles vaccination, may be given normal human immunoglobulin (NHIG) within 6 days (144 hours) of exposure. NHIG should be considered for high risk non-immune contacts of infectious measles cases. Time elapsed should be calculated from the first exposure to an infectious case. Availability of NHIG in Pacific island countries and areas is limited. Information has been included for completeness.

Monitor for the development of measles symptoms.
### Table 2 – Within 72hrs of first exposure to an infectious case of measles

<table>
<thead>
<tr>
<th>Age</th>
<th>0 doses of MCV or unknown</th>
<th>Measles vaccination history</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 dose of MCV</td>
</tr>
<tr>
<td>0-5 mo</td>
<td>Offer NHIG 0.2 ml/Kg only if mother has received &lt;2 doses of MCV and no history of past measles infection or negative maternal IgG (otherwise, do not give NHIG)</td>
<td>N/A</td>
</tr>
<tr>
<td>6-11 mo</td>
<td>Offer zero* (early) dose of MCV if within 72 hours of exposure, then give two (2) additional doses as part of the routine immunisation schedule in your country</td>
<td>N/A</td>
</tr>
<tr>
<td>≥12 mo</td>
<td>Offer MCV1 immediately if not pregnant or medical contraindication to MCV</td>
<td>Offer MCV2 (at least 4 weeks after initial dose)</td>
</tr>
<tr>
<td></td>
<td>If MCV contraindicated, offer NHIG 0.2 ml/Kg to a max 15ml</td>
<td>If MCV contraindicated, offer NHIG 0.2 ml/Kg to a max 15ml</td>
</tr>
<tr>
<td></td>
<td><strong>Prioritise</strong> high risk non-immune contacts for NHIG (e.g. pregnant women, household contacts, immunocompromised people, HCWs)</td>
<td>If pregnant –</td>
</tr>
<tr>
<td></td>
<td>If pregnant –</td>
<td>• Consult with obstetrician or other pre-natal care provider</td>
</tr>
<tr>
<td></td>
<td>• Consult with obstetrician or other pre-natal care provider</td>
<td>• Check measles IgG if time</td>
</tr>
<tr>
<td></td>
<td>• If IgG result not available, offer NHIG (0.2 ml/Kg to a max 15ml)</td>
<td>• If IgG result not available, offer NHIG (0.2 ml/Kg to a max 15ml)</td>
</tr>
</tbody>
</table>

| Immune compromised (any age) – Offer NHIG 0.5 ml/Kg to a max 15ml |

### Table 3 – From 72hrs to within 6 days (144 hrs) of the first exposure to an infectious measles case

<table>
<thead>
<tr>
<th>Age</th>
<th>0 doses of MCV or unknown</th>
<th>Measles vaccination history</th>
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<tr>
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</tr>
<tr>
<td>6-11 mo</td>
<td>Offer NHIG 0.2 ml/Kg</td>
<td>N/A</td>
</tr>
<tr>
<td>≥12 mo</td>
<td>Offer NHIG 0.2 ml/Kg to a max 15ml</td>
<td>Nil necessary; consider giving MCV depending on age if not pregnant</td>
</tr>
<tr>
<td></td>
<td><strong>Prioritise</strong> NHIG for high risk non-immune contacts (e.g. pregnant women, household contacts, immunocompromised people, HCWs)</td>
<td>If pregnant –</td>
</tr>
<tr>
<td></td>
<td>If pregnant –</td>
<td>• Consult with obstetrician or other pre-natal care provider</td>
</tr>
</tbody>
</table>
| | Check measles IgG if time  
| | If IgG result not available, offer NHIG (0.2 ml/Kg to a max 15ml)  
| | Immune compromised (any age) – Offer NHIG 0.5 ml/Kg to a max 15ml |

NB: If a contact has received post-exposure prophylaxis with MCV and develops measles symptoms, the case should be managed as measles case.
### Sources

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>WHO</td>
<td><em>Treating Measles in children, Department of Immunisation, Vaccines and Biologicals;</em> Department of Child and Adolescent Health (WHO/EPI/TRAM/97.02 (updated 2004))</td>
</tr>
</tbody>
</table>
| NSW Health | *Measles is about. Get Vaccinated*  
Annex 1: Healthcare isolation practices

Healthcare facilities can consider the following to improve their isolation practices:

- Post signs in their facility informing/reminding patients and healthcare workers of hygiene practices, including hand hygiene, covering the mouth/nose with a tissue when coughing and prompt disposal of used tissues, and using surgical masks on a coughing person when tolerated and appropriate.
- Post signs informing/reminding patients and healthcare workers the procedures for airborne precautions in the facility.
- Require and provide annual instruction regarding isolation precautions for healthcare workers.
- Perform routine audits of isolation practices to ensure healthcare workers are performing them correctly.
- Ensure non-infected patients are protected from airborne respiratory secretions of measles patients. If airborne infection isolation rooms (AIIR, a single-patient room equipped with special air handling and ventilation capacity that meets international standards for AIIRs2) are not available, the following table lists alternatives (in order of descending preference)3

<table>
<thead>
<tr>
<th>Room/Ward Type</th>
<th>Suggested Isolation Practices</th>
</tr>
</thead>
</table>
| Single Rooms   | • Single rooms reduce the risk of contact transmission from a source patient to others  
                  • Suitable types of single room isolation (in order of preference):  
                    1. AIIR (single-patient room with negative-pressure capabilities)  
                    2. Single room with air conditioning and an exhaust system (or external ventilation) to direct air outside of the building (preferably to an area without patient/visitor traffic)  
                    3. Single room with a fan (where available) placed to direct airflow towards an open window (window should face an area without patient/visitor traffic)  
                    4. Single room with no air circulation or window(s)  
                    • In all cases, any door(s) to the room should remain closed to prevent circulation of potentially contaminated air into the interior of the building |
| Cohorting      | • If single rooms are unavailable, patients with confirmed measles can be cohorted together  
                  • As patients with suspected measles may have another infection, they should never be placed with patients with confirmed measles as this will lead to transmission  
                  • Rooms or wards used for cohorting patients should be in a designated area, clearly marked and separated from other patient care areas.  
                  • Cohort areas should have separated airspace from other areas of the hospital (e.g. single room with the door closed or ward that is separated from other areas). |

Other elements of an airborne isolation program that must be instituted include:

- Ensure only staff who are immune to measles are in contact with measles cases.
- Staff should wear a respirator (N95 standard or better) or a mask if a respirator is unavailable.
- Mask is donned prior to room entry.
- In triage or waiting areas where isolation rooms are not available, a separate area for suspected measles patients should be used.

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3 Adapted from [http://www.wpro.who.int/publications/docs/practical_guidelines_infection_control.pdf](http://www.wpro.who.int/publications/docs/practical_guidelines_infection_control.pdf)
For transport and movement of infectious case-patient:

- Patient movement and transport from an isolation room or designated area should be limited to essential purposes only, limiting opportunities for transmission of measles.
- If movement is necessary, precautions should be taken to reduce the risk of transmission, such as placing a surgical mask on a patient with measles infection while in transport.
Annex 2 - Supplementary recommended treatment protocols

1. Uncomplicated cases (outpatient treatment)

a. Paracetamol PO: 20 mg/kg 3 times daily

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;2 months</th>
<th>2-11 months</th>
<th>1-4 years</th>
<th>5-10 years</th>
<th>11-15 years</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
<td>10-17 kg</td>
<td>18-32 kg</td>
<td>33-47 kg</td>
<td></td>
</tr>
<tr>
<td>Oral sol. 120 mg/5 ml</td>
<td>3 ml x 3</td>
<td>4 to 10 ml x 3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>100 mg tab</td>
<td>3/4 tab</td>
<td>1 to 2 tab</td>
<td>2 to 3 tab</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>500 mg tab</td>
<td>-</td>
<td>-</td>
<td>½ tab</td>
<td>½ to 1 tab</td>
<td>1½ to 2 tab</td>
<td>2 tab</td>
</tr>
</tbody>
</table>

b. Amoxicillin PO: 25 to 50 mg/kg 2 times daily for 5 days in children under 5 years

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 2 months</th>
<th>2-11 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
</tr>
<tr>
<td>Oral susp. 125 mg/5 ml</td>
<td>½ tsp</td>
<td>2 to 3 tsp</td>
</tr>
<tr>
<td>250 mg tab</td>
<td>1 tab</td>
<td>1 to 2 tab</td>
</tr>
<tr>
<td>500 mg tab</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

c. Retinol* (vitamin A) PO: one dose on Day1

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 6 months</th>
<th>6-11 months</th>
<th>1 year and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 7.5 kg</td>
<td>7.5-9 kg</td>
<td>10 kg and over</td>
</tr>
<tr>
<td>Dose</td>
<td>50 000 IU</td>
<td>100 000 IU</td>
<td>200 000 IU</td>
</tr>
</tbody>
</table>

* except in pregnant women

2. Complicated cases (inpatient treatment)

a. Paracetamol PO: 20 mg/kg 3 times daily

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;2 months</th>
<th>2-11 months</th>
<th>1-4 years</th>
<th>5-10 years</th>
<th>11-15 years</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
<td>10-17 kg</td>
<td>18-32 kg</td>
<td>33-47 kg</td>
<td></td>
</tr>
<tr>
<td>Oral sol. 120 mg/5 ml</td>
<td>3 ml x 3</td>
<td>4 to 10 ml</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>100 mg tab</td>
<td>3/4 tab</td>
<td>1 to 2 tab</td>
<td>2 to 3 tab</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>500 mg tab</td>
<td>-</td>
<td>-</td>
<td>½ tab</td>
<td>½ to 1 tab</td>
<td>1½ to 2 tab</td>
<td>2 tab</td>
</tr>
</tbody>
</table>

Only in case of high fever in a child who is vomiting repeatedly or whose consciousness is impaired, paracetamol IV, 500 mg vial (10 mg/ml, 50 ml). Administer paracetamol IV in 4 doses at 6-hour intervals. Each dose is administered over 15 minutes. Change to oral route as soon as possible

<table>
<thead>
<tr>
<th>Weight</th>
<th>&lt; 10 kg</th>
<th>10-50 kg</th>
<th>&gt; 50 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose to be administered every 6 hours (in mg)</td>
<td>7.5 mg/kg</td>
<td>15 mg/kg</td>
<td>1 g</td>
</tr>
<tr>
<td>Dose to be administered every 6 hours (in ml)</td>
<td>0.75 ml/kg</td>
<td>1.5 ml/kg</td>
<td>100 ml</td>
</tr>
<tr>
<td>Dose maximum</td>
<td>30 mg/kg/day</td>
<td>60 mg/kg/day</td>
<td>4 g/day</td>
</tr>
</tbody>
</table>
b. **Amoxicillin** PO: 25 to 50 mg/kg 2 times daily for 5 days in children under 5 years

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 2 months</th>
<th>2-11 months</th>
<th>1-4 years</th>
<th>5-10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
<td>10-17 kg</td>
<td>18-32 kg</td>
</tr>
<tr>
<td>Oral susp. 125 mg/5 ml</td>
<td>1½ tsp</td>
<td>2 to 3 tsp</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>250 mg tab</td>
<td>1 tab</td>
<td>1 to 2 tab</td>
<td>2 to 3 tab</td>
<td>-</td>
</tr>
<tr>
<td>500 mg tab</td>
<td>-</td>
<td>-</td>
<td>1 to 2 tab</td>
<td>2 to 3 tab</td>
</tr>
</tbody>
</table>

c. **Retinol** (vitamin A) PO: one dose on Day1 and Day2

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 6 months</th>
<th>6-11 months</th>
<th>1 year and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 7.5 kg</td>
<td>7.5-9 kg</td>
<td>10 kg and over</td>
</tr>
<tr>
<td>Dose</td>
<td>50 000 IU</td>
<td>100 000 IU</td>
<td>200 000 IU</td>
</tr>
<tr>
<td>200 000 IU capsule (8 drops)</td>
<td>2 drops</td>
<td>4 drops</td>
<td>1 capsule</td>
</tr>
</tbody>
</table>

Administer retinol PO in 2 doses (Day1, Day2) to all patients except:

- Pregnant women (contra-indicated);
- In the event of **corneal lesions** or **Bitot's spots** (in this case, give 3 doses, on days 1, 2 and 8).

### 3. Severe pneumonia

**a. Ceftriaxone** slow IV or IM (1 g to be dissolved in 5 ml): 100 mg/kg once daily

<table>
<thead>
<tr>
<th>Age</th>
<th>1-11 months</th>
<th>1-4 years</th>
<th>5-10 years</th>
<th>11-15 years</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>4-9 kg</td>
<td>10-17 kg</td>
<td>18-32 kg</td>
<td>33-47 kg</td>
<td>4 g</td>
</tr>
<tr>
<td>Dose</td>
<td>400 to 900 mg</td>
<td>1 to 1½ g</td>
<td>2 to 3 g</td>
<td>3 to 4 g</td>
<td>4 g</td>
</tr>
<tr>
<td>Volume to be injected (1 g vial /5 ml of diluent)</td>
<td>2 to 5 ml</td>
<td>1 to 1½ vial</td>
<td>2 to 3 vials</td>
<td>3 to 4 vials</td>
<td>4 vials</td>
</tr>
</tbody>
</table>

**Precautions:**

**IV injection:**

When ceftriaxone is administered by IV route, the powder (1 g) must be dissolved in 5 ml of water for injection.

**IM injection:**

Vials of ceftriaxone for IM injection are provided with a specific diluent containing lidocaine (lignocaine). **Once reconstituted with this diluent, ceftriaxone can be administered by IM route only, NEVER BY IV ROUTE.** Doses (in ml or vials) in the table above are based on a ceftriaxone concentration of 1 g diluted in 5 ml of diluent with lidocaine.

Always verify the dosage and the volume of diluent as they can vary according to the manufacturers (500 mg/2 ml, 500 mg/5 ml, 1 g/5 ml, 1 g/10 ml, etc.)

All of the diluent must be used for reconstitution. If the volume to be injected is large, administer half the dose into each buttock.
b. **Cloxacillin** IV infusion over 60 minutes (500 mg to be dissolved in 5 ml water for injection): 25 to 50 mg/kg every 6 hours

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 2 months</th>
<th>2-11 months</th>
<th>1-4 years</th>
<th>5-10 years</th>
<th>11-15 years</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
<td>10-17 kg</td>
<td>18-32 kg</td>
<td>33-47 kg</td>
<td></td>
</tr>
<tr>
<td>Dose</td>
<td>200 mg</td>
<td>250 to 400 mg</td>
<td>500 to 750 mg</td>
<td>1 g</td>
<td>1.5 g</td>
<td>2 g</td>
</tr>
<tr>
<td>Volume to be injected (500 mg vial /5 ml)</td>
<td>2 ml</td>
<td>2.5 to 4 ml</td>
<td>1 to 1½ vial</td>
<td>2 vials</td>
<td>3 vials</td>
<td>4 vials</td>
</tr>
</tbody>
</table>

Parenteral treatment for at least 3 days then, once the child no longer has fever or clinical signs of severe infection, change to **amoxicillin/clavulanic acid** PO: 40 mg/kg 2 times daily to complete 7 to 10 days of treatment.

4. **Severe laryngotracheobronchitis (croup)**

a. **Dexamethasone** (1 ml ampoule, 4 mg/ml) IM: 0.6 mg/kg single dose

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 2 months</th>
<th>2-11 months</th>
<th>1-4 years</th>
<th>3-4 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>&lt; 5 kg</td>
<td>5-9 kg</td>
<td>10-13 kg</td>
<td>14-17 kg</td>
</tr>
<tr>
<td>Dose</td>
<td>2 mg</td>
<td>4 mg</td>
<td>8 mg</td>
<td>10 mg</td>
</tr>
<tr>
<td>Volume to be injected</td>
<td>0.5 ml</td>
<td>1 ml</td>
<td>2 ml</td>
<td>2.5 ml</td>
</tr>
</tbody>
</table>

b. **Nebulized epinephrine** (1 mg ampoule, 1 mg/ml): 0.5 ml/kg per dose

<table>
<thead>
<tr>
<th>Age</th>
<th>1 month</th>
<th>2 months</th>
<th>3 months</th>
<th>4-6 months</th>
<th>7-9 months</th>
<th>10-11 months</th>
<th>1-4 years*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>4.5 kg</td>
<td>5 kg</td>
<td>6 kg</td>
<td>7 kg</td>
<td>8 kg</td>
<td>9 kg</td>
<td>10-17 kg</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>2 ml</td>
<td>2.5 ml</td>
<td>3 ml</td>
<td>3.5 ml</td>
<td>4 ml</td>
<td>4.5 ml</td>
<td>5 ml</td>
</tr>
<tr>
<td>(1 mg/ml ampoule)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.9% NaCl to be added</td>
<td>2 ml</td>
<td>2 ml</td>
<td>1 ml</td>
<td>1 ml</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*In children > 4 years or > 17 kg, the dose should not exceed 5 ml.*

c. **Oxygen** if cyanosis or SpO₂ < 90%