

Guidelines for paediatric health care workers caring for children with suspected Covid-19

Essential things health workers need to know about COVID-19

Typical clinical features: 2-5 (up to 14 day incubation period) days after exposure, sore throat, then dry cough, fever, runny nose, then some develop drip pneumonia.

Droplet spread: Coughing, sneezing, 2m away

Aerosol spread: Covid-19 virus stays in the air for up to 3 hours if aerosolised, especially important at risk procedures such as suctioning, nebulisation or intubation.

Contact spread: in public – door handles, handrails, buses, medical equipment etc.

Faecal-oral spread – some children have diarrhoea and excrete the virus in stool

The virus lives on hands for at least 10 minutes, but if you touch your mouth, nose, face, eyes → infection.

When the virus comes in contact a metal or plastic surface it can live for up to 3 days or more.

Cleaning with bleach is needed to remove it (see below).

Normal laundry detergent kills the virus from clothes. The sun kills the virus, so drying clothes in the sun helps.

COVID-19 mostly affects adults, and causes the most serious illness in adults over the age of 60, and adults who have hypertension (high blood pressure), diabetes, or chronic lung disease.

Health care workers who are over 60 years of age, especially if they have chronic ill health should not have contact with suspected COVID-19 patients, but can be deployed to non-COVID-19 related work.

Children and COVID-19

Symptoms and signs

Mild illness

URTI, cough, runny nose, most common (70-80%), very mild illness

Average age in other countries of COVID-19 proven cases in children is 7 years in China and 11 years in USA, but infants and young children under 5 are more commonly hospitalised.

Moderate-severe illness

Pneumonia: 5% of infected children are hypoxic; most just need oxygen for a few days

Severe illness is rare in children: only 0.6% are critical and need intensive care.

Another manifestation in children is an acute viral syndrome: high fever ($T > 39^{\circ}\text{C}$), red skin rash, diarrhoea and vomiting. Rarely it is associated with shock (hypotension), myocarditis, encephalitis, coagulopathy, and can look like toxic shock syndrome from Staph or Streptococcal infection, or a condition called Kawasaki disease.

Rarely COVID-19 causes acute flaccid paralysis (Guillain Barre Syndrome)

Outcomes in COVID-19 infected children

Very few paediatric deaths (10 child and adolescent deaths globally as of April 17), and most are adolescent patients.

Children with chronic underlying conditions, such as cerebral palsy, chronic lung disease, heart disease, type 1 diabetes, immune problems, are more likely to be hospitalised (but this is similar to other viruses).

Of over 2000 children in one report from China, only one child died
No children have died in Italy, despite over 20,000 adult deaths

Transmission from children

Children are much less likely to become seriously ill, and much less likely to transmit the virus to adults. This is important for health care workers to know, it should not lead to complacency, but should calm some fears. Nonetheless, wearing PPE (personal protective equipment) when caring for a child with COVID-19 is essential.

Testing

A “real-time PCR” test is available, this identifies active infection. Small proportion of false negative results at presentation on the initial test. Retest in 1-2 days with a highly suspected case (such as a child with fever and severe pneumonia, or a child with fever, rash, diarrhoea and vomiting, or a known contact of a COVID-19 case).

One PCR method uses GeneXpert machines (the same *machines* we use for Xpert MTB, but using new COVID-19 cartridges “SARS COV-2”). Test results within an hour.

Rapid antibody test kits are also available, but antibodies may not develop for 10-14 days after the onset of infection, so many children presenting with cough and fever will not yet have antibodies to COVID-19. Useful to know if a patient has had a recent or past infection.

Treatment of COVID-19 in children

Treatment is supportive.

Mild disease

If no signs of severe disease, manage at home, and instruct the family to isolate as best as they can for 14 days.

Check immunization status and update if needed.

If the child is unwell

Check oxygen saturation, triage emergency signs and examine for signs of respiratory distress. Follow standard treatment and Hospital Care for Children.

Admit to hospitalise a suspected case if the child is hypoxic, or has any other signs of severe pneumonia or any danger signs (inability to feed, severe respiratory distress, obstructed breathing, cyanosis, shock) – Give oxygen therapy, other standard therapies for pneumonia (standard antibiotics for moderate or severe pneumonia).

Put a surgical mask on any patient with COVID-19 if they are on oxygen therapy. Put the oxygen prongs on first, and fit the mask. This will provide added protection for staff.

Children with fever, rash, vomiting, diarrhoea, dehydration or shock: manage according to standard treatment and according to Hospital Care for Children guidelines:

Triage: Assess for emergency signs.

Signs of shock are: capillary refill >3 seconds, low volume pulses, hypotension (see table below), fast breathing, lethargic or poor conscious state.

Emergency treatment: give oxygen, intravenous fluid to correct dehydration if present

If the child still has clinical signs of shock after **commence an adrenaline infusion. Put 6mg adrenaline in 1000 ml normal saline and run at 0.5ml/kg/hour (0.05 mcg/kg/min).**

Admit to a ward where the child can be isolated and monitored. Reassess regularly.

Treatment: give antibiotic treatment for sepsis. Give aspirin if the child has rash and shock.

Monitor vital signs, SpO₂, hydration state, and blood pressure.

Supportive care: avoid over-hydration, check blood glucose, nutrition.

Almost all children with COVID-19 and shock improve over a few days with good supportive care and adrenaline if hypotension.

Age	Weight	Pulse range	Lowest normal systolic BP
Neonate	3.5kg	95-145	60
3 mth	6.0kg	110-175	60
6 mth	7.5kg	110-175	60
1 yr	10 kg	105-170	70
3 yr	14 kg	80-140	70
7 yr	22 kg	70-120	80
10 yr	30 kg	60-110	80
12 yr	38 kg	60-100	80
14 yr	50 kg	60-100	80

Drug treatment

Hydroxychloroquine (chloroquine) *probably does not help*. The most important aspect of treatment of severe illness is supportive care. Hydroxychloroquine *may* reduce the number of days a patient has Covid-19 virus in their nose, and therefore may reduce the risk of transmission. Further research will clarify the role of this drug, but it is not a magical cure, and there are potential side effects.

COVID-19 in pregnancy and the newborn baby

Pregnant women don't seem to be more likely to get COVID-19 than other healthy people of the same age. Most pregnant women who get coronavirus will probably have only mild or moderate symptoms. Coronavirus does not seem to pass from mothers to unborn babies during pregnancy, and unborn babies do not seem to be at increased risk during pregnancy. **Do not separate babies from mothers who have tested positive to COVID-19.**

WHO recommends that all mothers with confirmed or suspected COVID-19 continue to have skin-to-skin contact and to breastfeed. There is currently no evidence that the virus is carried in breastmilk. The main risk of breastfeeding for a mother who has COVID-19 is close contact between the mother and your baby leading to transmission of the virus, yet babies who get COVID-19 do not seem to get very sick. However we know that babies who don't get breast-milk get very sick, become malnourished and often die. And babies who are separated from their mothers are at increased risk of other infections, attachment and feeding problems. **So it is best to keep the baby with the mother.** Breast milk is best for babies, even if the mother has COVID-19. **They should isolate together,** and most likely they will both get over it.

Staff protection

Remember children are much less likely to transmit COVID-19 than adults, but there are higher risk procedures in a very unwell child when aerosolisation of virus can occur, including suctioning, nebulisation, intubation. The vast majority of children with COVID-19 have a mild illness, and those who get sick the majority only need oxygen and isolation.

During the previous Coronavirus SARS outbreak in 2003 in Asia, there were no cases where a health care worker was infected from a paediatric patient with SARS, in hospitals where they followed full precautions.

Protect staff from getting COVID-19 by hand washing, hand washing, hand washing, wearing protective equipment (PPE), and surface cleaning.

Wash hands – 5 moments:

1. Before touching the patient
2. After touching the patient
3. After body fluid exposure / risk
4. Before and after any procedure
5. After touching the patients surroundings

Isolate the patient (see ward set-up and home quarantine recommendations below)

PPE – Personal Protective Equipment (PPE) for health workers when caring for a case of COVID-19

- Wear a clean gown, and know how to take it off without contaminating yourself
- Wear a mask if you are caring for a case of COVID-19, know how to put it on so it is airtight at the nose, and fully covers the chin. Know how to take it off without contaminating yourself.
- Gloves and hand washing (hand washing is most important)
- Eye protection
- If you have none of these, be “bare to the elbows” and wash your hands, **distancing and avoiding contact with patients is important to limit spread and infecting yourself**
- Do not give a nebuliser to a patient with COVID-19 if you are not wearing a mask and eye protection, because nebuliser aerosolises virus particles and that is how some health workers have become infected.
- **Do not touch surfaces**, such as the patient’s bed, trolley. We just need to get used to not touching objects when we do not need to.
- Wash your clothes in laundry detergent and dry them in the sun.

Restrict visitors on the wards

Restrict visitors / caregivers in all hospital wards. No more than one caregiver at a time for all patients.

General prevention measures

Wash your hands often with soap and water – for at least 20 seconds, or use hand sanitiser containing at least 60% alcohol. Do the 5 moments of hand hygiene.

“Social distancing” – this is very important

- Do not congregate in large groups, no more than 2 at a time
- Stay 2m away from other people if you can
- Reduce the number of people on a ward round to the minimum needed
- Keep all potentially infected people away from the elderly
- **Do not shake hands** – wave and smile instead
- Stay home when you are sick

Cough etiquette

- Cover your cough or sneeze in your elbow, or with a tissue, then dispose of the tissue in the bin

- **Do not touch your face**, especially eyes, nose, and mouth, unless your hands are fully cleaned first.

Surface and equipment cleaning

- Regularly clean and disinfect touched objects and surfaces, trolleys, door handles using dilute bleach (0.5% sodium hypochlorite), at least twice a day. This will remove COVID-19 virus.
- Wash all oxygen equipment (nasal prongs) thoroughly with bleach (see recipe below for making 0.5% sodium hypochlorite) and dry in the sun, this will eliminate COVID-19 contamination. Clean oxygen concentrators daily with bleach.
- If you need to use a stethoscope, clean thoroughly between patients with 60%+ alcohol solution.

Cleaning oxygen and other medical equipment with bleach (0.5% sodium hypochlorite)

Preparation of 0.5% sodium hypochlorite solution. Dilute household bleach with the volume of tap water described in the table below. Bleach comes in various strengths of the active ingredient (sodium hypochlorite), check that on the bottle first, then dilute with the appropriate volume of water in a 1L container. Make up a fresh container every day, so that you have enough for cleaning all equipment and touched surfaces.

To make up disinfectant bleach solution (0.5% sodium hypochlorite) in a 1L container

% of sodium hypochlorite in household bleach	Volume of bleach	Volume of water
1%	500ml	500ml
2%	250ml	750ml
3%	170ml	830ml
4%	125ml	875ml
5%	100ml	900ml

Protective equipment must be worn while cleaning any equipment: wear a mask, goggles for eye protection, a fluid-resistant long-sleeved gown, and gloves.

First decontaminate equipment by mechanically cleaning oxygen tubing and other equipment of mucus and secretions. Then soak equipment in 0.5% sodium hypochlorite solution for 30 minutes. Thoroughly rinse the oxygen delivery devices before reuse. Do hand hygiene with soap and water or 60%+ alcohol before cleaning and after removing personal protective equipment.

Make sure the container of bleach (sodium hypochlorite) cleaning fluid has a secure top, is clearly marked as dangerous, and kept out of reach of children.

Isolation ward set-up

Allocate a separate isolation ward or space for paediatric patients who fulfil the clinical criteria of severe pneumonia or fever and viral syndrome and their caregivers. Keep all children with non-severe pneumonia or mild bronchiolitis out of hospital, and instruct families how to properly self-quarantine.

Increase bed spaces to 2m apart if possible, with ideally a barrier between them. This is often considered impractical, but in SARS a major contributor to spread in a ward was bed-spaces being too close together.

Install exhaust fans in wards and ED where respiratory patients are managed, if you can

We cannot reproduce “negative pressure isolation rooms” as in rich countries, but having exhaust fans in a ward, on the wall above each bed ideally, will extract any recirculating air, and make it much less likely that staff would inhale aerosolised virus. A 3m perimeter outside the ward would need to be fenced off, to keep others outside safe. Exhaust fans are fairly cheap and available, and hospitals should be encouraged to install them.

Oxygen concentrators

The majority of patients who are moderately unwell with COVID-19 just need oxygen and supportive care. **Oxygen concentrators are safe and effective for children and other patients with COVID-19, and safe for staff to use.** The residual gas from an oxygen concentrator (which is nearly all nitrogen after oxygen is extracted) is expelled from the machine into the room atmosphere, but this is *not* the gas that is exhaled from the patient. It is room air which goes through the canisters, minus the oxygen which goes to the patient.

If the patient exhales virus particles they could recirculate through the concentrator. This is much less likely if the concentrator is sufficiently away from the patient. Use longer oxygen tubing, and put the concentrators a distance of >2m from the patient. Concentrators have a fine-particle (internal) and large particle filter (at the back). They can also have an additional HEPA filter attached which will filter out all virus particles.

Paediatricians and paediatric nurses who are familiar with oxygen concentrators will have an important role in training other health workers who may be looking after adult patients in how to use oxygen concentrators and pulse oximeters.

Importance of routine services

COVID-19 carries big indirect risks for children: disruption to health services, social isolation and economic stress may kill more children than the virus. Children with HIV, tuberculosis and other chronic conditions still need their regular medications and their condition monitored, other acute infections still need to be treated, high-risk newborns still need special care, and immunization programs still need to function so as to not lose ground in the control of many diseases. Even brief interruptions to immunization programs have had disastrous consequences in recent years leading to deadly measles outbreaks and eroding efforts to eliminate polio. Therefore maintaining basic health and social services for children and families should be priorities.

Remember during the previous SARS outbreak, no paediatric health care worker was infected from a child with SARS. This is no reason for complacency, as many doctors and nurses have been affected by COVID-19, but it does give some reassurance to child health workers that if we take proper precautions we will be safe.