# OXYGEN THERAPY WITH LIMITED RESOURCES

## COVID-19 Severe Acute Respiratory Infection (SARI) and Pneumonia

Key points

1 Practical oxygen therapy. 2 Prevent infections in hospital staff.

Suspect and confirm diagnosis of COVID-19 infection

Case definition, clinically or if available by laboratory test.

Start infection prevention and control (IPC) measures[1]. Put a simple surgical face mask on the patient. Leave it in place to reduce the spread of the virus to staff and other patients.

Consider IPC issues of staff personal protection equipment (PPE), medical equipment and COVID-19 hospital areas[4].

Suspect (severe) pneumonia and confirm need for oxygen[2]

Adult or adolescent with fever or suspected respiratory infection, plus one of: respiratory rate > 22 breaths/min; severe respiratory distress; altered mental status or $SpO_2 \leq 90\%$ on room air.

Child with cough or difficulty in breathing, plus at least one of the following: central cyanosis or $SpO_2 < 90\%$; severe respiratory distress (e.g. grunting, very severe chest indrawing); signs of pneumonia with a general danger sign: inability to breast feed or drink, lethargy or unconsciousness, or convulsions. Other signs of pneumonia may be present: chest indrawing, fast breathing (in breaths/min): < 2 months ≥ 60; 2–11 months ≥ 50; 1–5 years ≥ 40.

Confirm hypoxia with pulse oximeter[2]

Start oxygen therapy if $SpO_2 < 90\%$.

Use oxygen delivery device: nasal cannula (prongs) or nasal catheter or face mask.

Nasal prongs recommended for child < 5 years.

Keep simple surgical face mask on patient, over nasal prongs and under any type of oxygen face mask. This reduces viral spread to staff and other patients.

Adjust $O_2$ flow to target $SpO_2 > 90\%$ adults & children. If signs of multi-organ failure including shock or alteration of mental status $SpO_2 > 94\%$. In pregnant patients target $SpO_2 > 92$ - 95%.

If the target $SpO_2 > 90\%$ cannot be achieved, or if $SpO_2 << 90\%$, suspect Acute Respiratory Distress Syndrome (ARDS). Consider nursing patient in the prone position for periods with a pillow under the chest. This may avoid the need for mechanical ventilation[3].

If the $SpO_2$ does not improve, advanced oxygen therapy and mechanical ventilation are required. If possible these patients should to be moved to another ward for management of intubation, oxygenation and ventilation. IPC measures with intubation, airway nursing care and ventilation are vital.

Oxygen delivery devices[4]
Titrate $O_2$ flow with $SpO_2$. Do not waste oxygen.

| | |
|---|---|
| Nasal prongs $O_2$ 1 – 5 L/min | → Fi $O_2$ 28% - 40% child and adult |
| Nasopharyngeal catheter $O_2$ 1 – 2 L/min | → Fi $O_2$ 45% - 60% infant and child |
| Oxygen face mask $O_2$ 6 – 10 L/min | → Fi $O_2$ 44% - 60% child and adult |
| Oxygen face mask reservoir bag $O_2$ 10 – 15 L/min | → Fi $O_2$ 60% - 95% |
| Venturi oxygen face mask $O_2$ 4 – 15 L/min | → Fi $O_2$ 24% - 60% |

*(for Venturi $O_2$ flow rate Fi $O_2$ device specific)*

Caution: ↑aerosolised droplet spread with high flow $O_2$ from all devices. Keep simple surgical face mask over prongs or under oxygen mask at all times.
Humidification should never be used: ↑viral spread and equipment may be contaminated.

The resource limitations are oxygen supply or availability of oxygen delivery devices

Assess and monitor oxygen supply.

Consider disinfection of nasal prongs, catheters and face masks. Infection prevention and control (IPC) measures are very important with contaminated medical equipment[5].

Oxygen supply[4]
Oxygen concentrators produce 4 – 10 L/min $O_2$.
Cylinders may not easily be refilled. Consider IPC measures if cylinder is at the bedside.
Bulk supply may not be available.

Decontamination and Disinfection[5, 6]
Decontaminate by mechanically cleaning oxygen delivery devices or any surface of secretions and mucus. Disinfect with 70% (ethyl or isopropyl) alcohol or soak in 0.1% sodium hypochlorite solution (1000 ppm available chlorine) for 30 minutes.

Preparation of 0.1% sodium hypochlorite solution[4]
Dilute household bleach (widely available), usually 5% = 5g sodium hypochlorite /100ml 1:50 with tap water. Add 1 measure of bleach to 49 measures of tap water. 5% sodium hypochlorite contains 50,000 ppm available chlorine, and the dilution contains 1000 ppm.

Check the concentration of the bleach sodium hypochlorite on label (in g/100ml) and adjust dilutions accordingly. For example: 2.5% sodium hypochlorite bleach contains 2.5g sodium hypochlorite /100ml. To 1 measure of bleach add 24 measures tap water. 4.2% sodium hypochlorite bleach contains 4.2g sodium hypochlorite /100ml. To 1 measure of bleach add 41 measures tap water. The dilutions all contain 1000 ppm available chlorine.

Prepare a container of solution in a well ventilated place. Avoid direct contact with eyes. Store covered, cool and shaded. Discard at 24 hours. Do not mix with detergents.

Thoroughly rinse the oxygen delivery devices before reuse.

**References:**

1 Infection prevention and control during health care when COVID-19 is suspected. Interim guidance 19 March 2020 WHO

2 Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected. Interim guidance 13 March 2020 WHO

3 Lower mortality of COVID-19 by early recognition and intervention: experience from Jiangsu Province. Sun, Q., Qiu, H., Huang, M. et al. Ann. Intensive Care 10**,** 33 (2020). https://doi.org/10.1186/s13613-020-00650-2

4 WHO UNICEF technical specifications and guidance for oxygen therapy devices. WHO Medical Device Series 2019. ISBN 978-92-4-151691-4 (WHO)

5 Infection prevention and control of epidemic–and pandemic–prone acute respiratory infections in health care. WHO Guidelines 2014. ISBN 978 92 4 150713 4

6 Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. G. Kampf, D. Todt, S. Pfaender, E. Steinmann. Journal of Hospital Infection 104 (2020) 246-251. https://doi.org/10.1016/j.jhin.2020.01.022

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# OXYGEN THERAPY WITH LIMITED RESOURCES

COVID-19 Severe Acute Respiratory Infection (SARI) and Pneumonia

**KEY POINTS**

- Practical oxygen therapy
- Prevent infections in hospital staff

**SUSPECT AND CONFIRM DIAGNOSIS**
of COVID-19 infection

- Diagnose by case definition, clinically, by laboratory test
- Put a simple surgical face mask on patient
- Start infection prevention and control (IPC) measures
- Consider staff personal protection (PPE), disinfect medical equipment and dedicated Covid-19 hospital spaces

**SUSPECT SEVERE PNEUMONIA and CONFIRM NEED FOR OXYGEN**

- Respiratory signs and symptoms
- Adult or adolescent $SpO_2$ **≤90%**
- Child $SpO_2$ **<90%**

**CONFIRM HYPOXIA PULSE OXIMETER**

- Start oxygen therapy if $SpO_2$ **<90%**
- Nasal cannula (prongs) *or* nasal catheter *or* face mask
- Nasal prongs for child < 5 years
- Adjust $O_2$ flow to target $SpO_2$ **>90%**
- Try prone position - pillow under chest
- If $SpO_2$ not ↑ or **<<90%** → advanced oxygen/ventilator care needed

**CAUTIONS**

- Keep surgical face mask over prongs/ under oxygen mask
- Droplet spread with high flow $O_2$ from all devices
- No humidification

**OXYGEN DELIVERY DEVICES**

- Nasal prongs $O_2$ 1–5 L/min ☑☑
- Nasal catheter $O_2$ 1–2 L/min (infant & child) ☑☑
- Oxygen face mask $O_2$ 6–10 L/min ☑☑☑
- Face mask reservoir bag $O_2$ 10-15 L/min ☑☑☑☑☑
  *Make sure reservoir bag inflates*
- Venturi oxygen face mask $O_2$ 4–15 L/min ☑☑☑☑
  *$O_2$ flow rate device specific*

**RESOURCE LIMITATIONS**

- Oxygen supply or the availability of oxygen delivery devices
- Assess and monitor oxygen supply
- Consider disinfection of prongs and masks

**DECONTAMINATION AND DISINFECTION**

- Physical cleaning
- Soak in 0.1% sodium hypochlorite solution for 30 minutes

*Contains 1000 ppm available chlorine*

**PREPARATION OF 0.1% SODIUM HYPOCHLORITE SOLUTION**

Check concentration of sodium hypochlorite in household bleach contains 5% *or* 5g/100ml sodium hypochlorite (= 50,000 ppm chlorine). Dilute bleach 1:50 with tap water. One measure of bleach to 49 measures of tap water makes 0.1% solution = 1000 ppm chlorine. If bleach concentration is less, dilute accordingly to give 0.1% solution = 1000 ppm chlorine. Prepare a bucket in a well ventilated place. Store covered in a cool shaded place and discard at 24 hours. Do not mix with detergents. Avoid contact with eyes.

**Thoroughly rinse the oxygen delivery devices before reuse.**