

COVID-19

Diagnosis and Management



WATSON INSTITUTE
INTERNATIONAL & PUBLIC AFFAIRS
BROWN UNIVERSITY

**CHR
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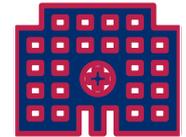
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project
HOPE[®]
Emergency
Response

Objectives

1. Diagnosis

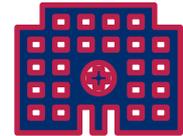
- Understand and be able to apply protocols for the diagnosis and treatment of COVID-19 in health facilities and community settings.
- Identify the clinical presentation of patients with COVID-19
- Be able to outline and describe the diagnostic approaches for COVID-19



Objectives

2. Management

- Understand which cases of suspected or confirmed COVID-19 can be **managed outside health facilities** and how such patients should be cared for in the community
- **Comprehend and apply management guidelines** for COVID-19 cases without critical illness
- Be aware of **experimental tests and treatments** under investigation that may have benefits in patients with COVID-19



COVID-19 Diagnosis: Obtaining Biologic Samples



Diagnosis

The Basics



Collect specimens from **BOTH**:

- Upper respiratory tract (URT) = nasopharyngeal and oropharyngeal
- Lower respiratory tract (LRT) = expectorated sputum, endotracheal aspirate, or bronchoalveolar lavage (for severely ill hospitalized patients only)

COVID-19 testing should be done by **nucleic acid amplification tests (NAAT)**, such as RT-PCR. A single URT sample does not exclude the diagnosis. If high clinical suspicion, especially in patients with pneumonia or severe illness, additional URT and LRT samples should be obtained.

Diagnosis



The Basics

Serology: Recommended **only** when RT-PCR is **not available**. The virus can be **detected in other specimens**, including stool, blood and potentially urine. Additional testing strategies should be guided by local recommendations.

Co-infections: Co-infections can occur. Patients meeting the suspected case definition should be tested for COVID-19 regardless of whether another respiratory pathogen is identified. Additional testing should be guided by local recommendations, but could include blood or sputum cultures, especially in seriously ill patients.

Deceased patients: Consider testing autopsy material including lung tissue.

Diagnosis

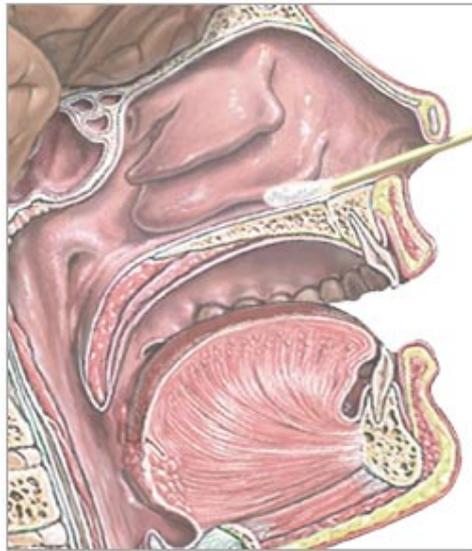


Personal Protective Equipment (PPE)

- **Droplet and contact precautions should be used for URT specimens**
- **Airborne precautions for LRT specimens**

Diagnosis

Obtaining URT Samples



A sterile swab is passed gently through the nostril and into the nasopharynx

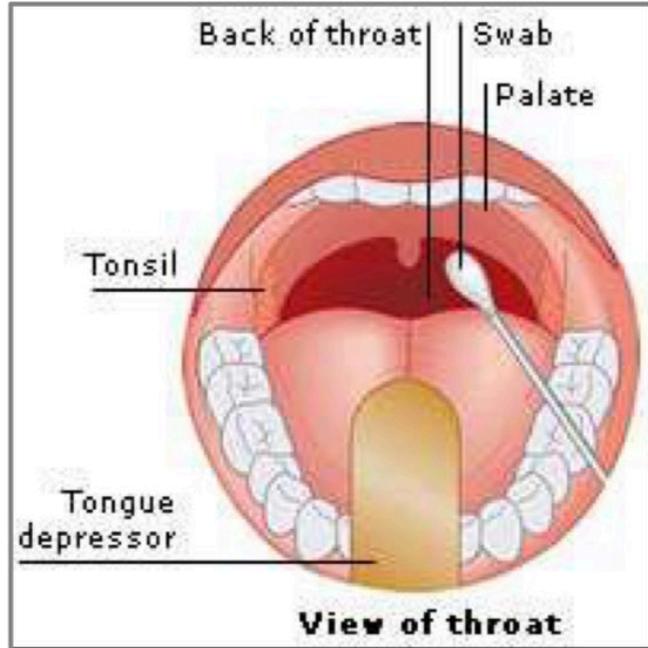


ADAM.

- Use: sterile Dacron or rayon swabs with plastic shafts
- **DON'T USE:** cotton swabs, calcium alginate swabs, swabs with wooden shafts
- Insert swab into nostril parallel to palate, leave in place for a few seconds. Avoid swabbing nostril.

Diagnosis

Obtaining URT Samples



- Use: sterile Dacron or rayon swabs with plastic shafts
- Swab the posterior pharynx
- Avoid the tongue and tonsils

Diagnosis

Obtaining LRT Samples



How to collect a bronchoalveolar lavage or tracheal aspirate?

- Collect **2-3 mL** into a sterile, leak-proof, screw-cap sputum **collection cup** or sterile **dry container**.

How to collect a sputum sample?

- Have the patient **rinse the mouth with water** and then **expectorate** deep cough sputum directly into a sterile, leak-proof, screw-cap sputum **collection cup** or sterile **dry container**
- Sputum induction is **NOT RECOMMENDED**

Diagnosis

Obtaining URT/LRT Samples



- Repeat URT/LRT samples should be collected in hospitalized patients with confirmed 2019-nCoV infection to demonstrate viral clearance.
- Recommended frequency of testing: at least every 2 to 4 days (but will depend on local resources)
- Continue re-testing until 2 consecutive negative results obtained at least 24 hours apart for both URT and LRT samples (if both are collected) AND patient has clinically recovered

Diagnosis

Confirming COVID-19 Infection

Nucleic acid amplification tests (NAAT) are used to confirm COVID-19 virus infection. Specific testing algorithms will depend on whether there is known local transmission - if widespread local transmission of COVID-19 virus exists, providers **must** maintain a high index of suspicion.



One or more negative test results does **not rule out** COVID-19.

False negatives may result from:

- Poor quality of the specimen
- The specimen was collected late or very early in the infection
- The specimen was not handled and shipped appropriately
- Technical reasons inherent in the test, e.g. virus mutation or PCR inhibition

If providers have a high index of suspicion but a patient tests negative, **consider obtaining additional URT/LRT samples.**

Diagnosis



Additional Laboratory Tests

Serology

- Serologic tests are currently under investigation – samples can be stored for these purposes.

Viral sequencing

- Viral sequencing can be used to confirm presence of the virus where available, but will mostly be used for epidemiologic/research purposes

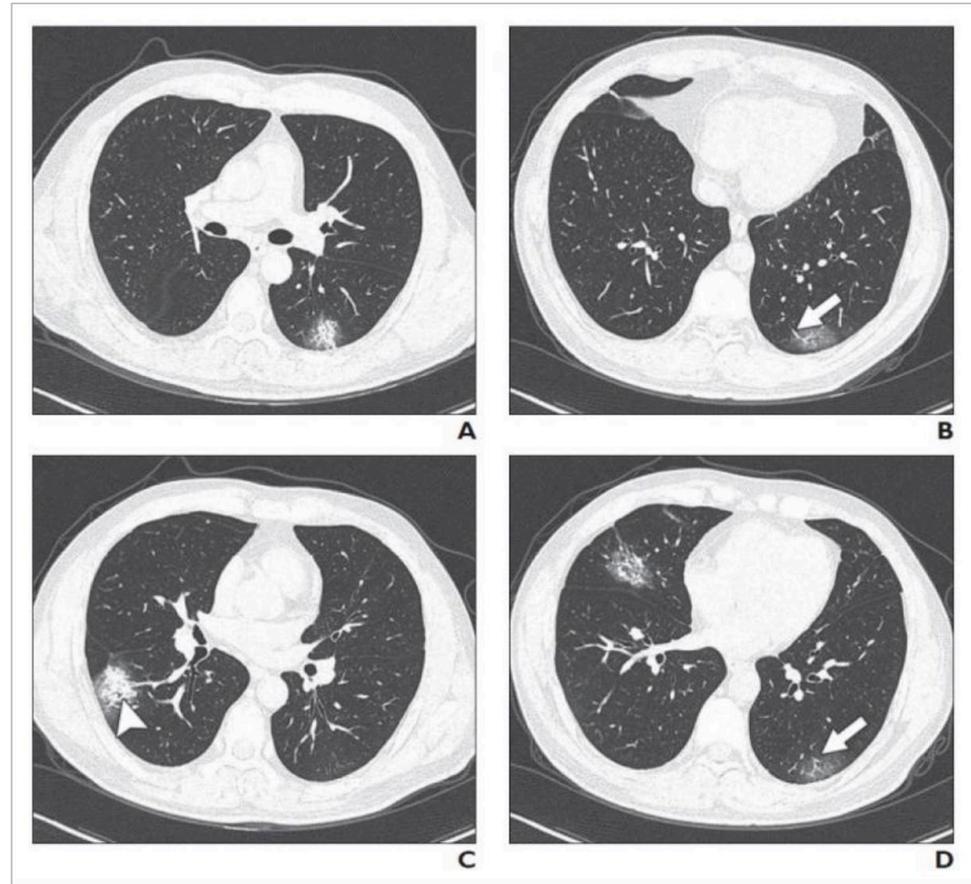
Viral culture

- **Not** recommended

Diagnosis

Imaging

- When available, either **Chest Computed Tomography (CT)** or X-ray can help to diagnose and/or evaluate COVID-19.
- “**Ground-Glass**” opacification is often indicative of viral pneumonia.
- Radiologic abnormalities caused by COVID-19 are more likely to be **bilateral**, have a **peripheral distribution** and involve the **lower lobes**.
- A negative CT scan is reassuring if still awaiting RT-PCR/confirmatory results.



Management of COVID-19 Clinical Syndromes



Management



Clinical Presentation

- Incubation Period is **2-14 Days**

Most Commonly Reported Signs & Symptoms Among Hospitalized Patients

Signs & Symptoms	% Reported at Illness Onset
Fever	77-98%
Cough	46-82%
Fatigue	11-52%
Shortness of Breath	3-31%

- The majority (89%) of patients who did not initially have fever developed fever during hospitalization
- **Less commonly reported symptoms:** sore throat, headache, cough with sputum and/or hemoptysis
- Some patients reported **gastrointestinal symptoms** (diarrhea and nausea) prior to developing fever and lower respiratory tract symptoms, though not commonly

Management

Clinical Course



- The clinical course **varies greatly**.
- Reports suggest the potential for **clinical deterioration** in the **second week** of illness.
- **20-30%** of hospitalized patients with COVID-19 and pneumonia have **required intensive care** for respiratory support.
 - These patients are typically **older** and more likely to have **comorbidities**.
- Mortality rates available are likely skewed upward as we do not have reliable data.
- **Limitation:** Most information available is limited to hospitalized patients with pneumonia.



Management

Clinical Syndromes

Uncomplicated Illness	Non-specific symptoms frequently seen in viral upper respiratory tract infections without evidence of dehydration, sepsis or shortness of breath in these patients.
Mild Pneumonia	Patient with pneumonia and no signs of severe pneumonia.
Severe Pneumonia	Respiratory infection with increased work of breathing and impaired oxygenation.
Acute Respiratory Distress Syndrome (ARDS)	Worsening respiratory symptoms with bilateral radiographic findings and severely impaired oxygenation.
Sepsis	Life-threatening organ dysfunction due to suspected or proven infection.
Septic Shock	Life-threatening, persistent hypotension despite volume resuscitation, requiring vasopressors to maintain BP

Management at
Home
For COVID-19
Patients with Mild
Symptoms





Management

Clinical Syndromes

Uncomplicated Illness

Non-specific symptoms frequently seen in viral upper respiratory tract infections, including:

- Fever
- Cough
- Sore throat
- Nasal congestion
- Malaise
- Headache
- Muscle pain

High risk patients, including the elderly and immunosuppressed, may have atypical symptoms.

There is no sign of dehydration, altered mental status, sepsis or shortness of breath in these patients

Management

Home Care for Mild Symptoms



Management



Home Care for Mild Symptoms

Who:

- Patients with **mild symptoms** and **without underlying chronic conditions** – such as lung or heart disease, renal failure or immunocompromising conditions - may be able to be cared for at home for the duration of their illness.
- Cases in which an informed decision has been made to **refuse hospitalization**.
- Situations in which **inpatient care is unavailable or unsafe**: This may occur when local healthcare capacity has been exceeded or when available resources are unable to meet demand.



Management

Home Care Basics

Prior to initiating home care: Verify that the residential setting is **suitable for providing home care.**

Important questions to ask include: Is the patient/family.....

- Capable of following precautions with respect to home care isolation?
- Able to follow hand and respiratory hygiene protocols for the home?
- Capable of carrying out necessary environmental cleaning?
- Able to follow quarantine procedures including limitations on movement around or from the house?
- Able to address safety concerns associated with using hand sanitizer?

After initiating home care:

HCW should have **close communication** with the patient until symptoms have completely resolved



Management

Home Care for Mild Symptoms

- Place the patient in a **well-ventilated single room** (i.e., open windows and an open door)
- **Limit patient movement** around the house
- **Minimize time spent in shared spaces**, ensure that those spaces are well ventilated
- Household members should stay in a different room or maintain **distance of at least 1 meter** – no shared beds.
 - **Limit the number of caregivers.**
 - Ideally, **one caregiver**, in good health and without any chronic or immunocompromising conditions, should be assigned to care for the ill individual.
- **Visitors should not be allowed** until the patient has completely recovered.

Management

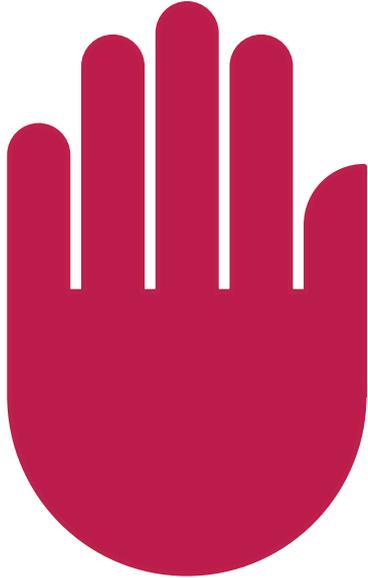
Home Care Basics



- Hand hygiene is essential.
- Hand hygiene should be performed after any contact with the patient or their immediate environment.
- Hand hygiene **should be performed before/after** preparing food, before eating, and after toileting.
- Hands should be **washed with soap and water** if visibly dirty.

Management

Home Care Basics



- Disposable **paper towels to dry hands** are preferred. If not available, clean cloth towels can be used and replaced when wet.
- Alcohol-based hand rub can be used if hands are not visibly dirty.
- A solution of **0.05% sodium hypochlorite (dilution of bleach)** can be used for hand hygiene in between hand washing when alcohol-based hand rubs are not available.
- Medication: to treat fever or pain, use paracetamol (acetaminophen). Non-steroidal anti-inflammatory drugs (NSAIDs) may be used as second line agents where available.

Management

Home Care Basics



- Respiratory hygiene is **essential**
- Patients should **wear medical masks** as much as possible
- The mouth and nose should be covered with a **disposable tissue** when coughing or sneezing
- Cloth handkerchiefs can be cleaned using **regular soap or detergent** and water and re-used
- Caregivers should wear a **tightly fitted medical mask** that covers their mouth and nose when in the same room as the patient
- Caregivers should **avoid direct contact with body fluids**, particularly oral or respiratory secretions, and stool
- **Disposable gloves and masks** should be worn when providing oral or respiratory care and when handling stool, urine and other waste
- **Perform hand hygiene** before and after removing gloves and masks

Management

Home Care Basics



Environmental Hygiene:

- Use **dedicated linen and eating utensils** for the patient; these items can be re-used after cleaning with soap and water.
 - Linens can be washed using regular laundry soap and water or machine wash at 60–90°C with household detergent. Dry thoroughly.
 - Contaminated linen should be placed in a laundry bag. **Avoid contact** with contaminated linens.
- **Clean and disinfect surfaces** that are frequently touched by the patient. Bathroom and toilet surfaces should be cleaned **at least once daily**.
 - Regular household soap or detergent should be used first, then household disinfectant.



Management

Home Care Basics



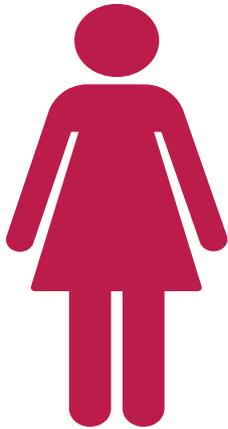
- **Environmental hygiene** is essential to preventing the spread of the virus.
 - **Gloves and protective clothing** like plastic aprons should be used when cleaning or handling contaminated clothing or linens.
 - Perform **hand hygiene** before and after removing gloves.
 - Trash should ideally be kept separate from other household trash
 - Ideally, waste should be disposed of at a **sanitary landfill** and not at an unmonitored open dump.
 - **Minimize caregiver exposure. Do not share** items including toothbrushes, cigarettes, eating utensils, dishes, drinks, linens
- Health care workers (HCWs) providing home care should use appropriate PPE and follow recommendations for droplet and contact precautions.

Management

Home Care Basics



Mothers who are breastfeeding:



- Mothers who are breastfeeding should be encouraged to **continue breastfeeding** even if they are suspected of having COVID-19.
- Breastfeeding has **significant benefits** including the transmission of antibodies to protect young children from infections, including respiratory viruses.
- The mother should **wear a medical mask** when near her baby and **perform hand hygiene before and after contact with the baby**.

Management

Home Care Basics



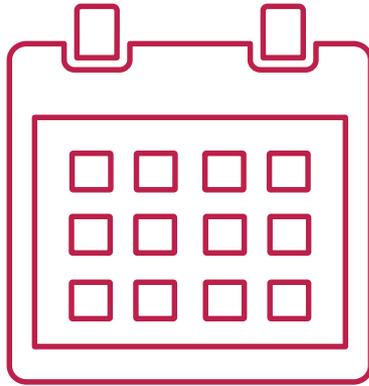
If the caregiver becomes ill:

- Caregivers should have a **pre-established communication plan** with a healthcare provider.
- Caregivers are considered contacts because of their potential daily exposure.
- The HCW **should instruct the caregiver in advance** about where and when to seek care if they become ill. The healthcare facility **should receive pre-notification** that a symptomatic contact will be arriving.
- While traveling, the symptomatic contact should **wear a mask to protect others**. Avoid public transportation. Ambulance or private vehicle may be used.
- Contaminated surfaces in the home should be **cleaned** with soap/detergent and then disinfected with regular household 0.5% diluted bleach solution.



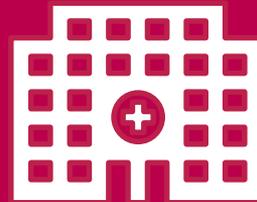
Management

Progression of Illness



- All patients should be **monitored closely** for deterioration.
- Clinical symptoms may worsen as the illness progresses to a lower respiratory tract disease, **particularly in the second week** of illness.
- Risk factors for disease progression include: older age, immunocompromising conditions, pregnancy, and underlying chronic medical conditions (lung disease, cancer, heart failure, diabetes, etc).

Management of Hospitalized Patients: Early Supportive Therapy



Management

Clinical Syndromes



Mild Pneumonia

No signs of severe pneumonia
Children: cough or difficulty breathing + fast breathing.
Fast breathing (in breaths/min) is defined as:

- <2 months old, ≥ 60
- 2–11 months old, ≥ 50
- 1–5 years old, ≥ 40 and no signs of severe pneumonia

Severe Pneumonia

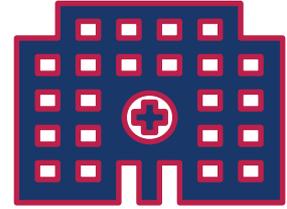
Adolescent/adult: fever or suspected respiratory infection, plus one of respiratory rate >30 breaths/min, severe respiratory distress, or SpO₂ $<90\%$ on room air.
Children: cough or difficulty in breathing, plus at least one of the following:

- central cyanosis or SpO₂ $<90\%$ on room air
- severe respiratory distress (e.g. grunting, very severe chest indrawing)
- signs of pneumonia with a general danger sign (inability to breastfeed or drink, lethargy or unconsciousness, or convulsions)

*Other signs of pneumonia may be present: chest indrawing, fast breathing.
*The diagnosis is clinical and imaging is not required; chest imaging can exclude complications.

Management

Early Supportive Therapy

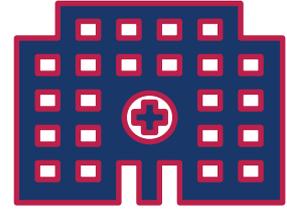


✓ RECOMMENDED: Supplemental Oxygen

- Supplemental oxygen should be **given to all patients** with Severe Acute Respiratory Infection (SARI) and respiratory distress, hypoxemia, or shock.
- **Resource allocation:** Patients with SARI should be cared for in areas equipped with pulse oximeters, functioning oxygen systems and disposable, single-use, oxygen-delivering interfaces (nasal cannula, simple face mask, and mask with reservoir bag).
- IPC concerns: **Use contact precautions** when handling contaminated oxygen interfaces of patients with nCoV infection.

Management

Early Supportive Therapy



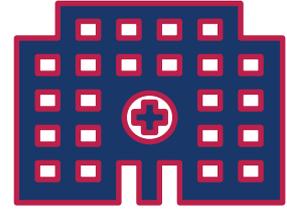
RECOMMENDED: Intravenous Fluids

- Intravenous fluids should generally be **reserved** for patients with evidence of shock. In patients without evidence of shock, conservative fluid management should be used.
- Patients with SARI should be treated **cautiously** with intravenous fluids. Aggressive fluid resuscitation may worsen oxygenation, requiring non-invasive (BiPAP/CPAP) or invasive (mechanical ventilation) support to overcome. Judicious administration of intravenous fluids is particularly important in settings with limited availability of BiPAP/CPAP or mechanical ventilation.

Management

Early Supportive Therapy

✓ RECOMMENDED: Empiric Antimicrobials



Initiate antimicrobials within 1 hour of initial assessment for patients with sepsis.

Initiate empiric antimicrobials to treat all likely pathogens:

- Choose antimicrobials based on clinical diagnosis (community-acquired pneumonia vs health care-associated pneumonia), local epidemiology and susceptibility data, and local guidelines.
- Empiric therapy should include treatment with a neuraminidase inhibitor to cover for influenza if there is known local circulation of the virus or other risk factors present.
- De-escalate empiric therapy based on microbiology results and patient condition/improvement.

Management

Early Supportive Therapy



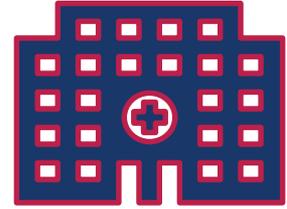
RECOMMENDED: Close Patient Monitoring

Monitor **ALL** patients for clinical deterioration.

- Clinical deterioration **may present as** rapidly progressive respiratory failure, sepsis, altered mental status.
- Communicate proactively with patients and families.
- Consider **role co-morbid conditions** may play in the patient's clinical course.

Decisions regarding life-sustaining interventions should take into account patient values/preferences, local customs, and resource availability.

Upon discharge: Patients and caregivers should receive clear information on signs and symptoms to monitor for and when to return to the healthcare facility.

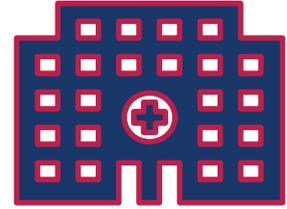


Management

Early Supportive Therapy



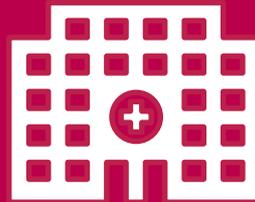
NOT RECOMMENDED: Corticosteroids



Routine administration of systemic corticosteroids for treatment of viral pneumonia or ARDS, like the use of non-steroidal anti-inflammatories is not recommended **unless** indicated for another reason.

Studies investigating the use of corticosteroids administered to patients with SARS, MERS and influenza demonstrated no survival benefit and possible harm. Routine administration of corticosteroids **may result in** increased mortality and secondary infections, avascular necrosis, psychosis, diabetes, and delayed viral clearance.

Management of Hospitalized Patients: Hypoxemic Respiratory Failure and ARDS





Management

Clinical Syndromes

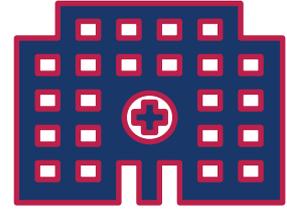
Acute Respiratory Distress Syndrome (ARDS)

- Worsening respiratory symptoms with radiographic findings and severely impaired oxygenation that are not fully explained by cardiac failure or fluid overload
- Onset: new or worsening respiratory symptoms within one week of known clinical insult.



Management

Hypoxemic Respiratory Failure and ARDS



RECOMMENDED: Recognize the Patient is Worsening

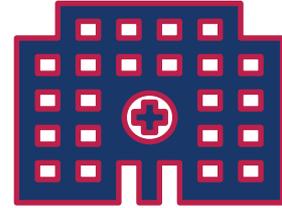
The first step is **recognizing** severe hypoxemic respiratory failure in patients who have ongoing respiratory distress and are failing oxygen therapy.

- Patients may have continued **increased work of breathing or hypoxemia** despite supplemental oxygen.
- **Oxygen** can be delivered via face mask with reservoir bag at **flow rates of 10-15 L/min**. This is typically the minimum flow required to maintain bag inflation.

Hypoxemic respiratory failure in ARDS commonly results from intrapulmonary ventilation-perfusion mismatch or shunt and usually requires mechanical ventilation.

Management

Hypoxemic Respiratory Failure and ARDS



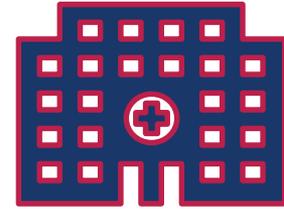
CAUTION: High-Flow Nasal Oxygen or Non-Invasive Ventilation

- If HFNO or NIV is used, patients should be closely monitored for clinical deterioration. If **no improvement** after one hour, proceed to intubation.
- HFNO and NIV are **not recommended** in patients with hemodynamic instability or multi-organ failure.
- HFNO is generally **not recommended** in patients with hypercapnia.
- Inappropriate NIV use may have risks to patients including delayed intubation, large tidal volumes, and lung damage due to high transpulmonary pressures.

However, if HFNO or NIV is used, recent studies suggest they are associated with **low risk** of airborne transmission provided the systems fit the patients well.

Management

Hypoxemic Respiratory Failure and ARDS



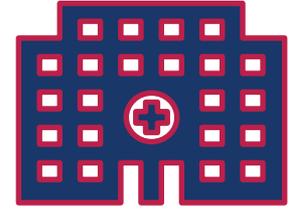
RECOMMENDED: Endotracheal Intubation

Endotracheal intubation should be performed using airborne precautions.

- Intubation should be performed by an **experienced operator**.
- **Pre-oxygenate** with 100% FiO₂ for 5 minutes, via a face mask with reservoir bag, bag-valve mask, HFNO, or NIV, to minimize risk of desaturation.
- Rapid sequence intubation is appropriate after an airway assessment that identifies no signs of difficult intubation.

Management

Hypoxemic Respiratory Failure and ARDS



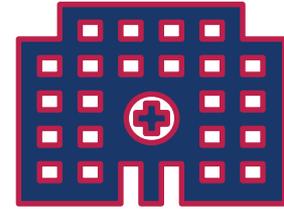
RECOMMENDED: Mechanical Ventilation in Adults

Goals:

- Smaller tidal volumes are recommended: 4–8 ml/kg predicted body weight; **initial tidal volume 6 ml/kg** predicted body weight.
- Lower inspiratory pressures are recommended: **plateau pressure <30 cm H₂O**.
- **Goal pH 7.30-7.45**: hypercapnia is permitted if meeting this goal.
- Patients may require **deep sedation** to meet these targets.
- **Prone ventilation** for >12 hours per day is recommended in patients with severe ARDS.
- If no evidence of hypoperfusion, follow a conservative fluid management strategy.

Management

Hypoxemic Respiratory Failure and ARDS



CAUTION: Mechanical Ventilation Strategies in Adults

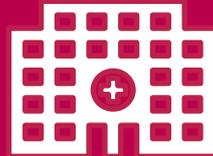
- In patients with **moderate or severe ARDS**, higher PEEP instead of lower PEEP is suggested. Recruitment maneuvers involving is episodic periods of high continuous positive airway pressure [30–40 cm H₂O], progressive incremental increases in PEEP with constant driving pressure, or high driving pressure, may also be required. Discontinue if patients do not respond appropriately.
- In patients with **moderate-severe ARDS** (PaO₂/FiO₂ <150), neuromuscular blockade by continuous infusion should not be routinely used.
- Consider referral of patients with refractory hypoxemia to centers capable of extracorporeal life support (ECLS / ECMO).



NOT RECOMMENDED: Avoid Disconnecting Patient from Ventilator

This results in loss of PEEP and causes atelectasis.

Management of Hospitalized Patients: Sepsis and Septic Shock



Management

Clinical Syndromes



Sepsis

SIRS: Temperature, tachycardia/bradycardia, tachypnea or mechanical ventilation, abnormal leukocyte count or bandemia

SOFA: Sequential organ failure assessment score

Sepsis is defined by an increase in the SOFA score of ≥ 2 points. Assume the baseline score is zero if data are not available

Adults: life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection, with organ dysfunction. Signs of organ dysfunction include: altered mental status, difficult or fast breathing, low oxygen saturation, reduced urine output, fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling, or laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate or hyperbilirubinemia.

Children: suspected or proven infection and ≥ 2 SIRS criteria, of which one must be abnormal temperature or white blood cell count.

The SOFA score can be used to assess organ dysfunction due to sepsis. The score ranges from 0 to 24. Points are attributed based on 6 organ systems: respiratory (hypoxemia defined by low PaO₂/FiO₂), coagulation (low platelets), liver (high bilirubin), cardiovascular (hypotension), central nervous system (low level of consciousness defined by Glasgow Coma Scale), and renal (low urine output or high creatinine).

Management

Clinical Syndromes



Septic Shock

Adults: persistent hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥ 65 mmHg and serum lactate level > 2 mmol/L

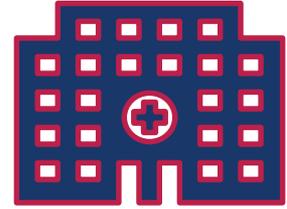
Children: any *hypotension (SBP < 5 th percentile or > 2 SD below normal for age) or 2-3 of the following:

- Altered mental state
- Tachycardia or bradycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70 bpm or > 150 bpm in children)
- Prolonged capillary refill (> 2 sec) or warm vasodilation with bounding pulses
- Tachypnea
- Mottled skin or petechial or purpuric rash
- Increased lactate
- Oliguria
- Hyperthermia or hypothermia

* Hypotension is often a late finding of septic shock in pediatric patients

Management

Septic Shock



RECOMMENDED: Recognize Septic Shock Early

The first step is recognizing septic shock in patients who have suspected or confirmed infection AND ongoing hypotension requiring vasopressors to maintain perfusion.

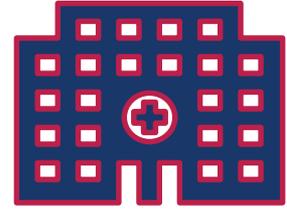
If lactate measurement is not available, use mean arterial pressure (MAP) and clinical signs of perfusion to define shock.

Within the first hour, administer antimicrobials, fluid resuscitate and initiate vasopressors

- In adults, give at least 30 ml/kg of isotonic crystalloid in adults in the first 3 hours.
- In children in well-resourced settings, give 20 ml/kg as a rapid bolus and up to 40-60 ml/kg in the first 1 hr. In settings with high rates of malnutrition, avoid giving a fluid bolus unless the child is hypotensive.

Management

Septic Shock



RECOMMENDED: Intravenous Fluid Resuscitation

Isotonic crystalloid fluids should be used. Crystalloids include normal saline and Ringer's lactate.

Additional fluid boluses: 250 to 1000 ml in adults or 10-20 ml/kg in children

Perfusion targets: MAP (>65 mmHg or age-appropriate targets in children), urine output (>0.5 ml/kg/hr in adults, 1 ml/kg/hr in children), and improvement of skin mottling, capillary refill, level of consciousness, and lactate.

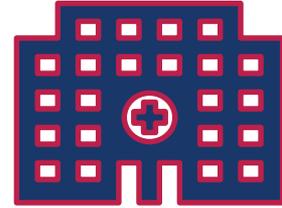


CAUTION: Fluid Resuscitation May Cause Volume Overload

- Fluid resuscitation may cause **volume overload and respiratory failure**.
- Signs of volume overload include jugular venous distension, crackles on lung exam, pulmonary edema (on imaging) or hepatomegaly (children).

Management

Septic Shock



NOT RECOMMENDED: Hypotonic Crystalloids, Starches or Gelatins

Hypotonic solutions are less effective than isotonic solutions at increasing intravascular volume.

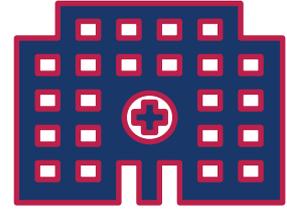
- Starches are associated with an increased risk of death and acute kidney injury
- The effects of gelatins are less clear, but they are more expensive than crystalloids.

If patient is not improving with fluid loading and there are signs of volume overload, reduce or discontinue fluids.

This step is particularly important where mechanical ventilation is not available or resources are limited.

Management

Septic Shock



✓ RECOMMENDED: Vasopressors

- Administer vasopressors when shock persists during or after fluid resuscitation.
- Blood pressure target is **MAP \geq 65 mmHg**.

Monitor blood pressure frequently, use the lowest dose necessary to maintain perfusion

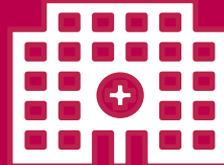
- **Norepinephrine** is first-line in adult patients.
- Reserve **dopamine** for selected patients with low risk of tachyarrhythmia.



CAUTION: Central Venous and Arterial Catheters

- **Central venous and arterial catheters may be used depending on availability.**
- Vasopressors are **safest** when given through a **central line**, but can be given through a peripheral IV or intraosseous needle (IO) if central venous catheters are not available.
- If vasopressors will be administered **peripherally**, it is important to use a large vein and closely monitor for signs of poor perfusion.

Management of Hospitalized Patients: Preventing Potential Complications





Management

Measures to Reduce Potential Complications

<p>Reduce days of invasive mechanical ventilation</p>	<ul style="list-style-type: none"> • Implement weaning protocols • Minimize continuous or intermittent sedation as much as possible
<p>Reduce incidence of ventilator-associated pneumonia</p>	<ul style="list-style-type: none"> • Oral intubation preferable to nasal intubation in adolescents & adults • Maintain head of bed elevation 30-45° • Use closed suctioning system, perform maintenance as needed • Use new ventilator circuit for each pt, discard soiled/damaged circuits • Change heat moisture exchanger when it malfunctions, when soiled, or every 5–7 days
<p>Reduce incidence of venous thromboembolism</p>	<ul style="list-style-type: none"> • Use pharmacological prophylaxis (low molecular-weight heparin [preferred if available] or heparin 5000 units subcutaneously twice daily) in adolescents and adults without contraindications or use mechanical prophylaxis (intermittent pneumatic compression devices)

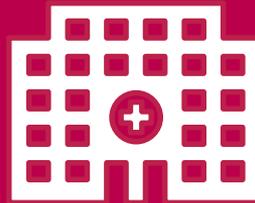


Management

Measures to Reduce Potential Complications

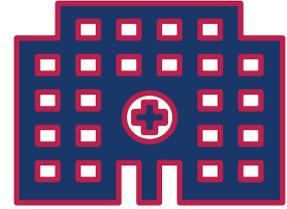
Reduce incidence of catheter-related bloodstream infection	<ul style="list-style-type: none"> • Checklists can help improve insertion sterility • Remove catheter when no longer needed
Reduce incidence of pressure ulcers	<ul style="list-style-type: none"> • Turn patient every two hours
Reduce incidence of stress ulcers and gastrointestinal bleeding	<ul style="list-style-type: none"> • Initiate early enteral nutrition (within 24–48 hours of admission) • Administer H2 receptor blockers or PPIs in patients with risk factors for GI bleeding. Risk factors for GI bleeding include mechanical ventilation for ≥48 hours, coagulopathy, renal replacement therapy, liver disease, multiple comorbidities, and higher organ failure score
Reduce incidence of ICU-related weakness	<ul style="list-style-type: none"> • Actively mobilize the patient early in the course of illness when safe to do so

Management of Hospitalized Patients: Special Considerations



Management

Special Consideration: Pregnant Women



RECOMMENDED: Supportive Therapies

Pregnant women with suspected or confirmed COVID-19 infection should be treated with **supportive therapies** as described above, taking into account the physiologic adaptations of pregnancy.



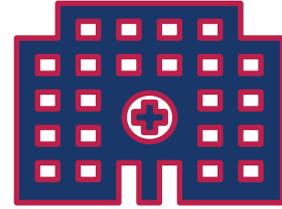
CAUTION: Mother-Baby Dyad Care

Consider **temporarily separating** the mother (confirmed COVID-19 or PUI) from her baby until the mother has recovered.

- If mother and baby are separated and mother would like to provide expressed breast milk, a **dedicated breast pump** should be provided and the mother should **practice hand hygiene** before and after expressing milk.
- Expressed milk can be fed to the newborn by a healthy family member.
- If baby and mother will stay together, mother should wear a mask and use hand hygiene.

Management

Special Consideration: COVID-19 Treatments



CAUTION: No Specific COVID-19 Treatment Available Yet

Antivirals

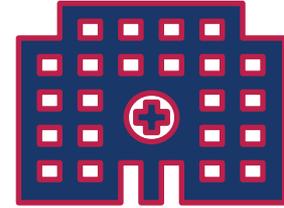
- **Remdesivir** – Shows in vitro activity against SARS-CoV-2 and has been used to treat patients in China and U.S.
- Clinical trials using Remdesivir have started in these two countries.
- Other antivirals, including Lopinavir/Ritonavir, have been trialed and have not shown significant benefit.

Chloroquine and Hydroxychloroquine

- Both are being trialed in some patients with COVID-19
- Chloroquine shows in vitro activity against SARS-CoV-2
- Chloroquine is recommended by some experts in China for mild to severe cases of COVID-19

Management

Special Consideration: COVID-19 Treatments



CAUTION: No Specific COVID-19 Treatment Available Yet

Angiotensin-II Receptor Agonists

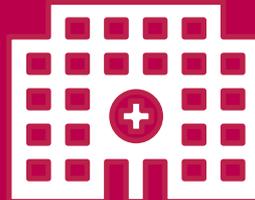
- Medications in this class, such as Losartan, are being investigated.
- It is thought that Angiotensin Converting Enzyme 2 (ACE2) receptor is the main binding site for the virus.

Convalescent Plasma

- Convalescent plasma from patients who have recovered has been used as a treatment in previous virus outbreaks including Ebola, SARS, and avian flu.
- Clinical trials using convalescent plasma for treatment of COVID-19 are underway in China and U.S.

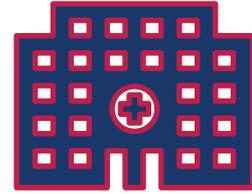
*Other treatments being trialed include intravenous immunoglobulin and stem cell therapy.

Management of Hospitalized Patients: Discontinuation of Precautions



Management

Discontinuation of Transmission-Based Precautions



✓ RECOMMENDED: Supportive Therapies

- Resolution of fever without antipyretic medication, improvement in clinical symptoms, and (ideally) two sets of negative URT samples (both nasopharyngeal and throat swabs) taken at least 24 hours apart.

Discharge **before two sets of negative tests:**

- The patient is clinically stable **AND**
- The patient can return to a setting where they can be
- appropriately monitored and cared for **AND**
- The patient can be appropriately isolated (i.e. take appropriate transmission-based infection control precautions) upon leaving the hospital.

Resources

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