Respiratory support in Covid 19 Patient

Dr.Binod Kumar Singh

Professor & Head
Dept. of Pediatrics, NMCH, Patna
IAP State President, Bihar- 2019
CIAP Executive board member-2015
NNF State president, Bihar- 2014
IAP State secretary,Bihar-2010-2011
NNF State secretary,Bihar-2008-2009
Fellow of Indian Academy of Pediatrics (FIAP)

- **Consultant Neonatologist & Pediatrician**

Shiv Shishu Hospital :K-208, P.C Colony,Hanuman Nagar,
Patna – 800020
Web site : www.shivshishuhospital.com

Respiratory support in Covid 19 Patient

- Coronavirus disease 2019(COVID-19) pandemic is caused by the severe acute respiratory syndrome coronavirus -2 (SARS-Cov2).
- COVID 19 is a global health crisis.
- First being reported in Wuhan ,China in December 2019.

Virology and Epidemiology

- Corona viruses belong to a family of enveloped, single stranded ,zoonotic RNA viruses.
- They can rapidly mutate and recombine leading to novel viruses that can spread from animal to humans.
- SARS-Cov2 is transmitted through inhalation of respiratory droplets and through surface contaminated with the virus.

- Previous Coronavirus epidemic were SARS 2002-3 and Middle East Respiratory Syndrome (MERS) infection.
- SARS-CoV-2 has a higher transmission capability compared to previous viruses.
- True case fatality rate vary between 0.5-5%

PATHOGENESIS

- SARS-CoV-2 virus utilizes ACE2 receptors as its cell surface receptors.
- ACE2 is expressed highly by ciliated epithelial cell in human lungs.
- Severe COVID -19 disease is characterized by three phases:

  Viral phase

  Cytokine storm

  ARDS, impaired cardiac function and death

PATHOGENESIS

- Cytokine storm appears to be driven by a dysregulated host immune response.
- Cytokine storm is similar to secondary hemophagocytic lymphohistiocytosis (HLH).
- Higher D-dimer and FDP leading to thrombosis and multiorgan failure.

Clinical features

- Children of all age can be infected by COVID-19,with more cases reported in younger children and infant.
- Incubation period (2-10 days)
- Symptoms

  Fever(50%)

  Cough(38%)

  Sore throat, rhinorrhea, myalgia,fatigue,diarrhea

Clinical features

- Severe COVID-19 manifest as features of hypoxemia and hypoperfusion.
- ARDS
- Myocarditis
- Septic shock
- DIC
- AKI
- MODS

Severity classification

- Severity is divided into asymptomatic, mild, moderate , severe and critical.
- The definition of severe included children with only mild hypoxia.
- Critical COVID-19 defined by presence of ARDS or organ failure

Laboratory diagnosis

- RT-PCR of nose and throat swab has been recommended as the confirmatory test for COVID-19.
- Alternative sample for RT-PCR include BAL and endotracheal aspirate.
- Rapid serology testing- may not be positive in first 7-10 days.

Laboratory diagnosis

- Sensitivity of RT-PCR patient is as follow

  BAL(93%)

  Sputum(72%)

  Nasal swab(63%)

  Bronchoscopic brush biopsy(46%)

  Pharyngeal swab (32%)

General guidelines

- Trained health professionals to wear PPE with latex free purple nitrile gloves while collecting the samples.

Respiratory specimen collection method

Upper respiratory tract:

1) Use only synthetic fibre swabs(dacron or rayon) with plastic shafts.
2) Do not use cotton or calcium alginate swabs or swab with wooden shaft.
3) For nasopharyngeal swab tilt patient head back 70 degree.
4) For throat swab take a second dry swab.

Respiratory specimen collection method

Lower respiratory tract:

1) BAL and Endotracheal Aspirate-collect 2-3 ml into a leak proof sputum collection cup or sterile dry container.

Laboratory diagnosis

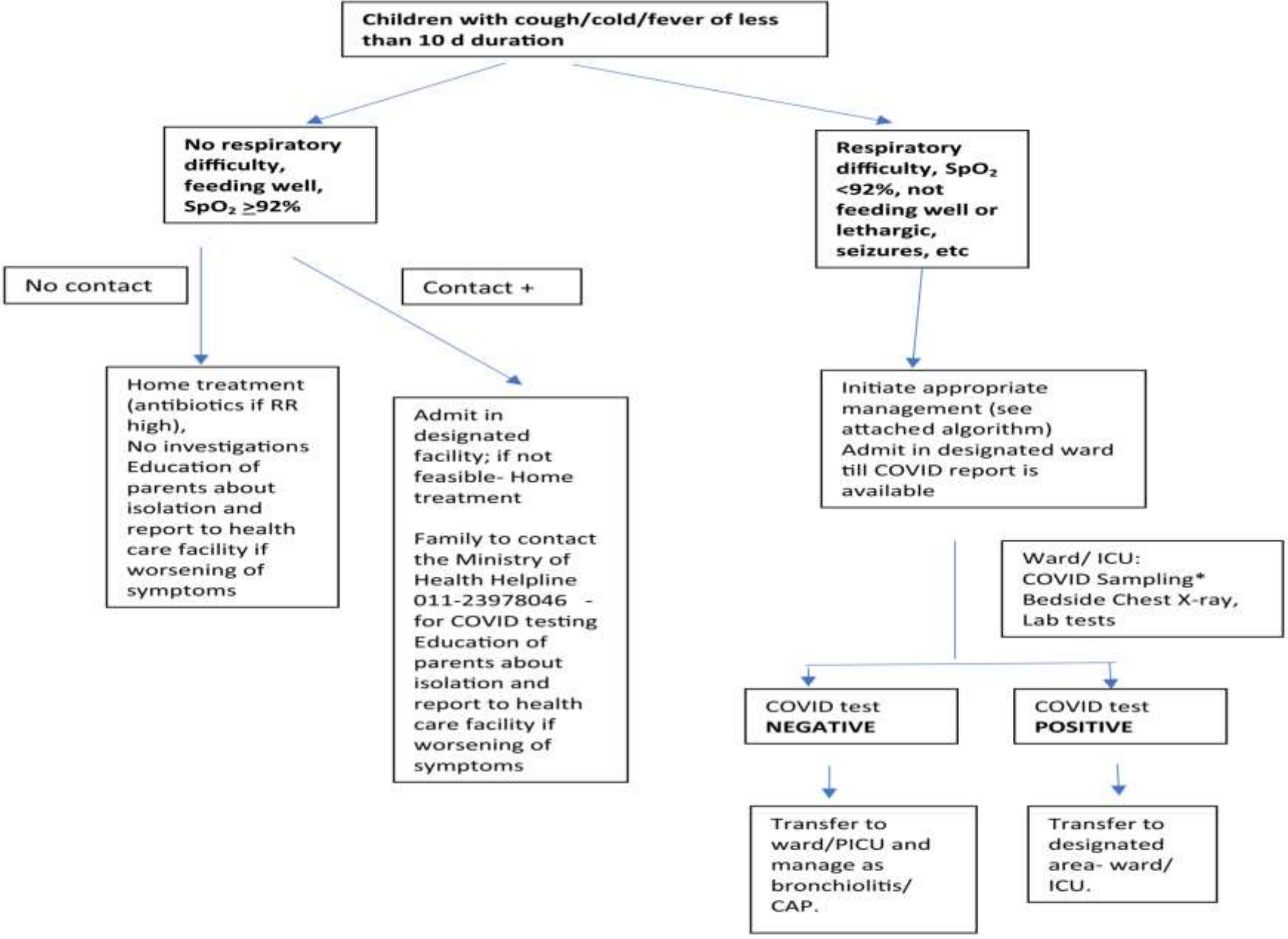
- CDC does not currently recommend chest radiography or CT to diagnose COVID-19.

  CT findings –Ground glass opacity(33%)

  Consolidation with surrounding halo is typical of paediatric patients.

Laboratory diagnosis

- Normal to low leucocyte counts
- Elevated CRP and procalcitonin
- Relatively lower rate of lymphopenia and elevated inflammatory markers as compared to adults.
- Deranged LFT and KFT
- Deranged coagulation profile



***Testing**

Respiratory sample: Nasopharyngeal and oropharyngeal swab together sent in viral transport medium, posterior-pharyngeal swab, endotracheal aspirate, or bronchoalveolar lavage.

Approach to a child with acute respiratory symptoms during COVID-19 pandemic

Management of paediatric COVID-19

- Infection prevention control(IPC)
- Standard precaution such as hand hygiene, use of PPE, safe waste management.

Indication for hospital admission

- Patients classified as Severe pneumonia and critically ill should be admitted to hospital.
- Following criteria may particularly be considered for admission(Any One)

  Respiratory distress

  Spo2 < 92% on room air

  Shock/poor perfusion

  Poor oral intake

  Lethargic/seizure/encephalopathy

- At present there is no separate guideline for children who is having underlying chronic illness, immunocompromised state, heart disease and CKD patient.

Mild illness: No respiratory difficulty, are feeding well,SpO2>92%

1) The current guidelines recommend admission in isolation facility for all positive cases
2) Appropriate antibiotic, if respiratory rate is high.
3) Supportive care : Control of fever, avoid NSAIDs.
4) Ensure adequate hydration.

Management in hospitalized cases

- General measures:

1) Oxygen supplementation to maintain Spo2>92%.
2) Fluid management
3) Symptomatic treatment of fever
4) Empirical antimicrobial after sending blood culture
5) Oseltamivir may be considered if influenza is suspected.
6) MDI with spacer is preferred

Respiratory support

- One of the key considerations during management is mitigating risk to HCW
- Hypoxemia can be managed by oxygen supplementation.
- Management of SARI in COVID-19 is similar to any other viral pneumonia with ARDS but with strict precautions to reduce risk of transmission.

Protection from Aerosol

- Use of PPE
- Replace nebulizer by MDI with spacer for nebulisation.

Oxygen Therapy

- Start oxygen therapy for patient with spo2 less than 92% and/or with signs of respiratory distress.
- Low flow oxygen devices are recommended.
- Nasal cannula at flow of 2-4 L/ min for milder form of SARI.
- Triple layer mask over nasal cannula should be used.

Heated Humidified high flow nasal cannula(HHHFNC/HFNC)

- HFNC can be useful special situation for hypoxia. A flow of 2-3 ml/kg with Fio2 targeted to spo2 is used.
- For HFNC ,child should be managed in negative pressure rooms if available.
- HFNC should be tried for a maximum of 1-2 hours

Non invasive ventilation

- There is paucity of literature regarding use of NIV in respiratory pandemics.
- Routine use of NIV is not recommended in COVID-19.It should be used only in selected patients with hypoxemic respiratory failure.
- Negative pressure rooms are preferable for patient on NIV.

Non invasive ventilation

- Risk of NIV include delayed intubation, large tidal volume and injurious trans pulmonary pressure.
- P/F ratio is an accurate indicator of oxygenation on NIV.
- Invasive ventilation must be considered if P/F ratio is below 300.
- S/F ratio if arterial line is not possible.

Non invasive ventilation

- WHO also recommend the use of NIV for mild cases of ARDS without hemodynamic instability.
- Conventional ventilator with NIV option is safer option than NIV ventilator.

Non invasive ventilation

- Bubble CPAP: Where both NIV and invasive mechanical ventilation is not available, bubble CPAP may be used .

Invasive ventilation

- Patient with known contraindication of NIV like moderate ARDS(P/F<200), hemodynamic instability , multi-organ failure, altered sensorium should receive invasive ventilation.
- Worsening trend of S/F ratio< 200
- Worsening respiratory distress
- > 60% oxygen requirement on HFNC
- MODS

Invasive ventilation

- Video laryngoscopy is ideal.
- Premedication with benzodiazepine and fentanyl combination.
- Pre oxygenation with NRM
- Avoid bag and mask ventilation to limit aerosol.

Invasive ventilation

- Intubation with cuffed ET tube in all ages.
- Use disposable circuits with viral filter attached at expiratory limb.

Invasive ventilation

Lung protective mechanical ventilation.

- Low tidal volume
- Limiting plateau pressures to < 30 cm H2O
- High PEEP >10 mm Hg.
- Permissive hypercapnea.

Invasive ventilation

- Prone ventilation: Recommended strategy in adults with P/F ratio <150.
- Patient is kept for 12-16 hours .
- In children it may not be possible due to limited availability of HCW and PPEs.
- if P/F ratio>150 for 1 to 2 hours---may change the posture

Fluid management

- Fluid restriction to 70-80% of maintenance.

VAP Prevention

- VAP bundled strategy should be strictly implemented as per recommendation.

Management of septic shock

- As per Surviving sepsis campaign guidelines

Supportive care

- Head elevation
- Oral hygiene
- Glycemic control
- Foley’ catheterisation
- Ryles tube
- Central venous catheter
- Posture change

Weaning and extubation

- Extubation should be performed if patient is ready for extubating to nasal O2.
- Post extubation NIV is avoided.

Specific Therapy

- No specific antivirals have been proven to be effective as per currently available data.
- Hydroxychloroquine and chloroquine have been demonstrated to have anti SARS-CoV-2 activity in vitro.
- Mechanisms for antiviral activity of hydroxychloroquine include inhibiting membrane fusion, inhibiting viral entry by changing glycosylation of ACE2 receptor.

Specific Therapy

- Azithromycin
- Lopinavir/Ritonavir
- Currently there are no paediatric studies.
- Clinical indications for starting virus suppressive therapy(Hydroxychloroquine or Lopinavir/Ritonavir) include patient with suspected or confirmed COVID 19 with severe pneumonia or critically ill patient.

Specific Therapy

- Dose of hydroxychloroquine 7-8 mg/kg/dose twice daily for day 1 and then day 2-5, 7-8 mg/kg once a day.
- Do not co-administer Lopinavir/Ritonavir and Hydroxychloroquine due to drug interaction.
- Anti IL-6 receptor antibody (Tocilizumab).
- IL-1 receptor blocker(Anakinra)
- Janus Kinase inhibitor
- Convalescent plasma transfusion.

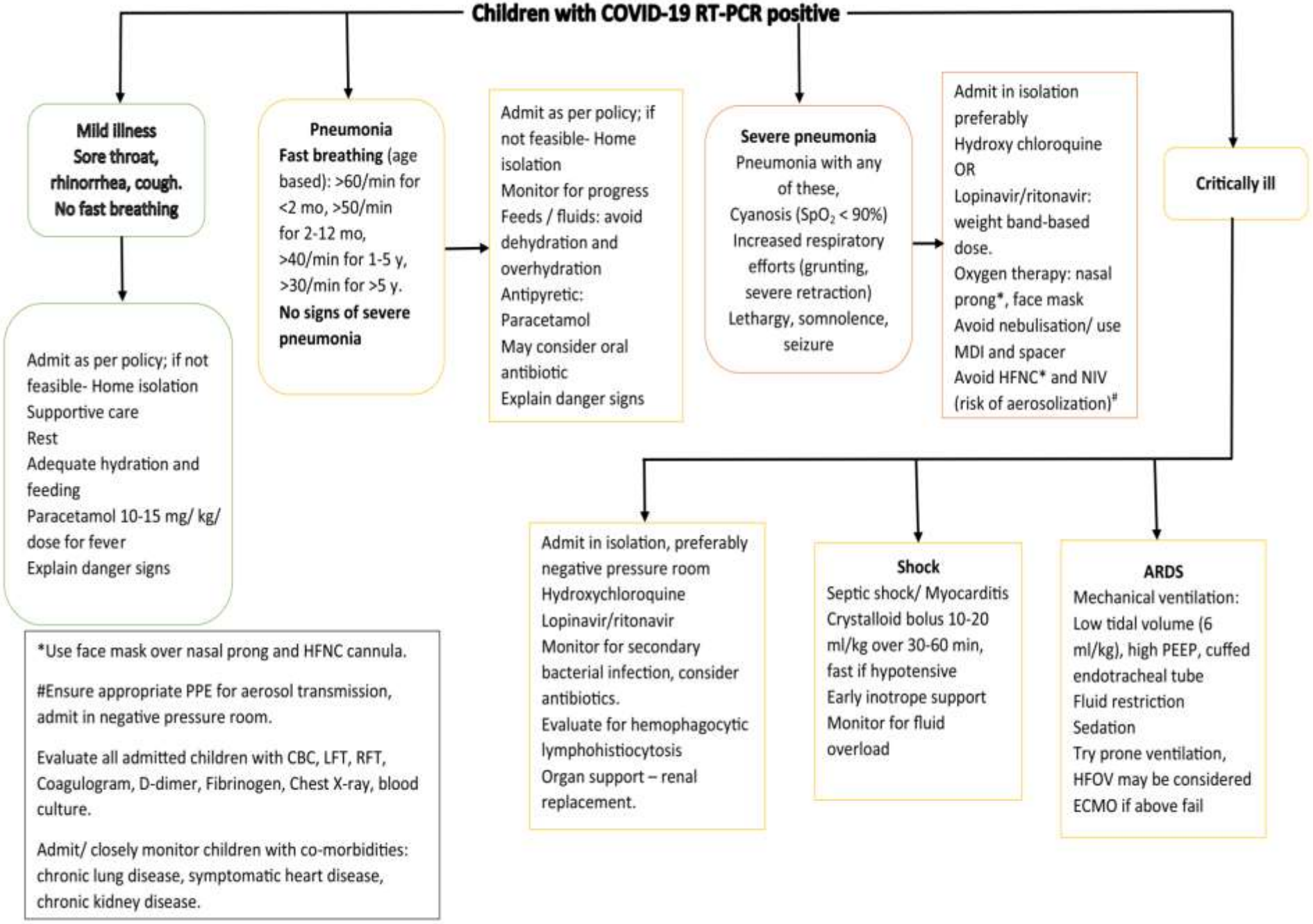
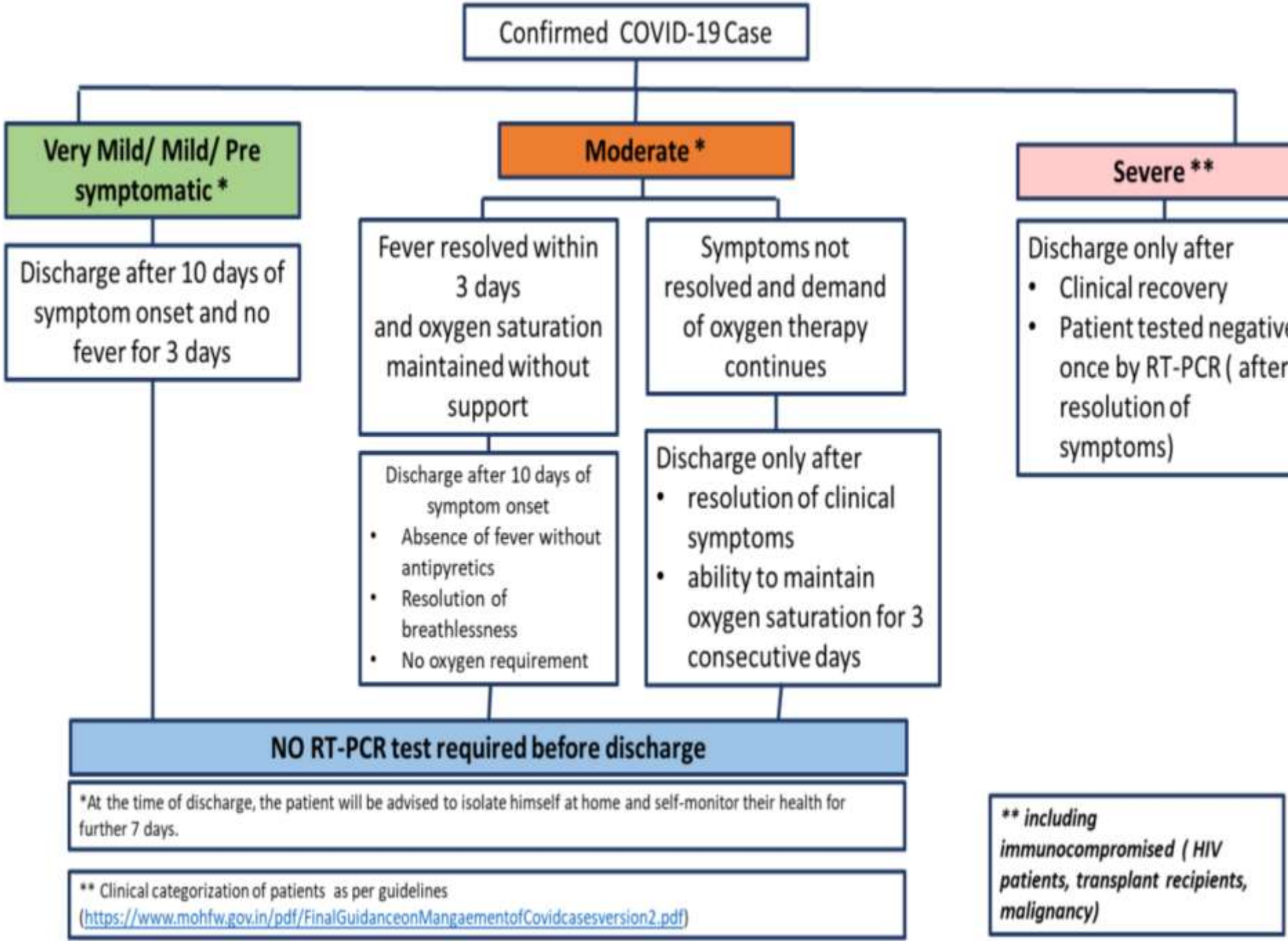
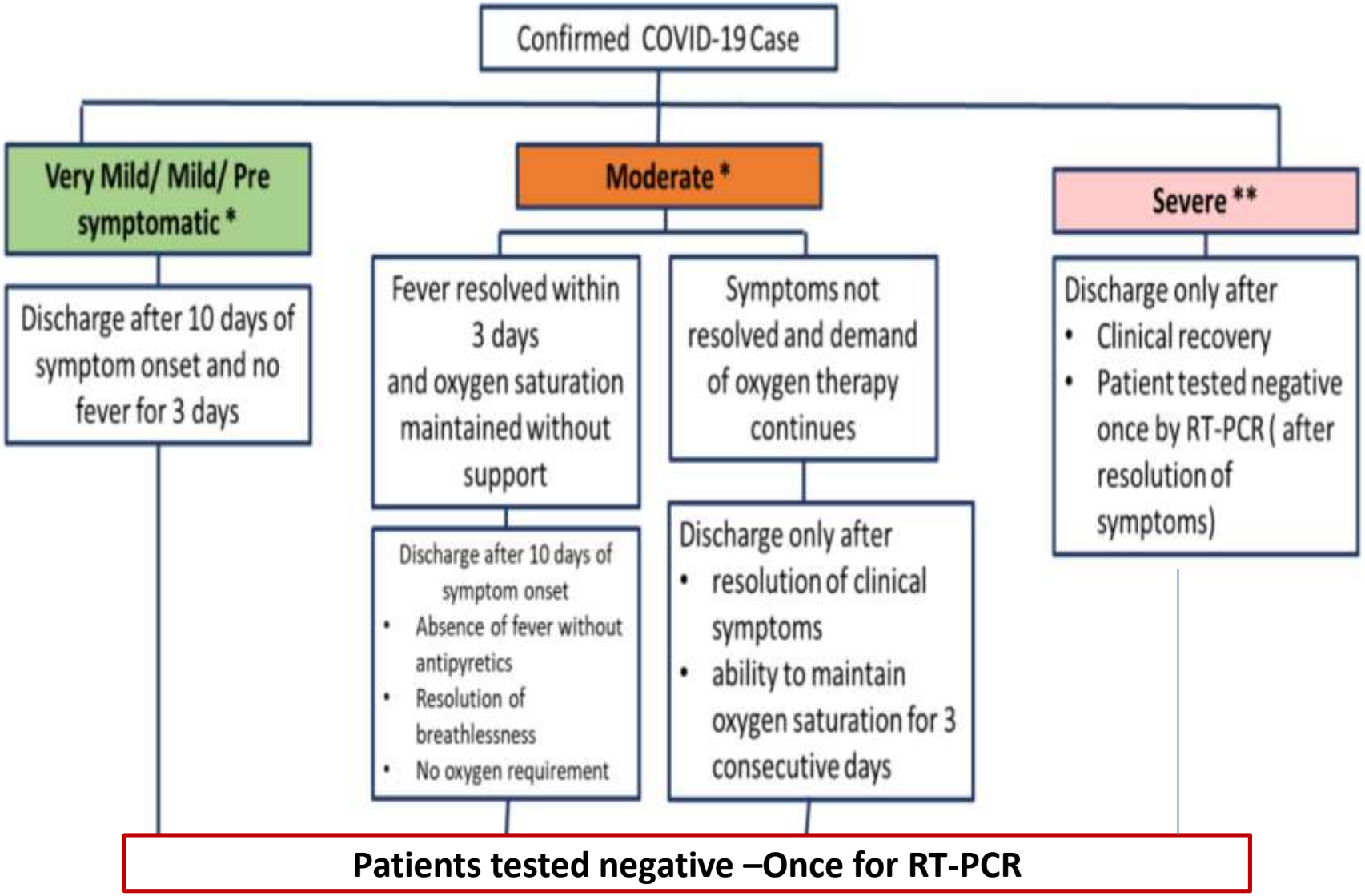


Fig. 2 Summary of management of children with COVID-19

Revised discharge policy for nCOVID-19 cases as per MOHFW



Revised discharge policy for nCOVID-19 cases as per Govt Of Bihar



*At the time of discharge, the patient will be advised to isolate himself at home and self-monitor their health for further 7 days.

** Clinical categorization of patients as per guidelines (https://www.mohfw.gov.in/pdf/FinalGuidanceonMangaementofCovidcasesversion2.pdf)

***** including immunocompromised (HIV patients, transplant recipients, malignancy)***

SARS-CoV-2 in neonates

Controversy exists regarding COVID -19 transmission in utero.

Before delivery:

1) Specific simulation training on management of mother and infant with COVID-19 in every delivery setting.
2) Organize a separate path for suspected or diagnosed COVID-19 cases.

SARS-CoV-2 in neonates

3) Assure screening procedure in a dedicated area before arrival in delivery unit.
4) Suspected or diagnosed mother should be managed in airborne infection isolation until delivery.
5) Dedicated delivery room/operating theater (Negative pressure room).
6) Designate a room equipped with an infant warmer next to delivery room or resuscitation bed> 6 feet from mother bed.

SARS-CoV-2 in neonates

7) Multidisciplinary team with minimum number of HCW for scenario(ideally, 2 members for neonatal resuscitation).
8) Clearly define function and roles of team members for resuscitation.
9) Equipment check(based on NRP guidelines)
10) Videolaryngoscopy.
11) Rescue personnel for resuscitation.

SARS-CoV-2 in neonates

During delivery:

1) Personal protection
2) Delayed cord clamping
3) Skin to skin contact not recommended
4) Neonatal stabilization/resuscitation steps as usually indicated

SARS-CoV-2 in neonates

After delivery:

1) All PPE should be removed
2) Cleaning of delivery room
3) Manage mother in an isolated room
4) Care of the baby at a distance of >6 feet from mother or in a different room
5) Send the maternal specimen for SARS-CoV-2 testing

SARS-CoV-2 in neonates

7) Test the baby for SARS-CoV-2(nasal and oropharyngeal swabs) 24 hours after delivery.
8) Consider expressed breast milk.
9) Healthy and neonate with two negative SARS-CoV-2 tests 24 hours apart should be discharged to their mother with contact and droplet precautions until mother has two negative tests.

SARS-CoV-2 in neonates

10) Mother should wear the face mask and should be managed based on routine local protocols.

11) All test for SARS-CoV2 in breast milk were negative in 6 mothers reported by Chen et al.

12) However there is insufficient evidence regarding the safety of breast feeding and the need for mother-baby separation.

CONCLUSIONS

Current recommendations on the management of suspected or confirmed COVID-19 mothers and their infants are based on limited and incomplete data, requiring continuous and comprehensive updates.


THANK YOU