COVID-19
Clinical Case Management

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COVID-19 Hospital Training of Trainers

Clinical Case Management
World Update

Coronavirus Cases: 33,08,901
Deaths: 2,34,139
Recovered: 10,42,995
India Update

Coronavirus Cases: 35,043
Deaths: 1154
Recovered: 9,068
Overview

- Presumed Pathophysiology
- Clinical Presentation
- Radiological findings
- Treatment protocol
- Oxygen therapy
- Immunotherapy
- ICU Indications
Presumed Pathophysiology
*Spike proteins
*Binds to heme part of Hb
*Hemolysis
* Hypoxia
*Acute kidney Injury
*Myocarditis
*Encephalopathy
*Cytokine storm
L and H types Pneumonia

**L Type**
- Low elastance
- High compliance
- Low VQ ratio
- Low lung weight
- Low lung recruitability

**H type**
- High elastance
- Low compliance
- High Right to Left shunt
- High lung weight
- High lung recruitability

Transition from L to H type……
Clinical presentation
Case Definition

When to suspect

All symptomatic individuals who have undertaken international travel in the last 14 days

or

All symptomatic contacts of laboratory confirmed cases

or

All symptomatic healthcare personnel (HCP)

or

All hospitalized patients with severe acute respiratory illness (SARI) (fever AND cough and/or shortness of breath)

or

Asymptomatic direct and high risk contacts of a confirmed case (should be tested once between day 5 and day 14 after contact)

Symptomatic refers to fever/cough/shortness of breath.

Direct and high-risk contacts include those who live in the same household with a confirmed case and HCP who examined a confirmed case.
Confirmed case

- A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms
Types of COVID dedicated facilities

- COVID Care Center (CCC)
- Dedicated COVID Health Center (DCHC)
- Dedicated COVID Hospital (DCH)

- Suspect and confirmed cases should not be allowed to mix under any circumstances
- All these facilities will follow strict infection prevention and control practices
COVID Care Center (CCC) (For Group 1 category of cases)

1. For cases clinically assigned as **mild / very mild cases / suspect cases**
2. Facilities can be setup in hostels, hotels, schools, stadiums, lodges etc. *(Functional Hospitals as last resort)*
3. Separate areas for suspect and confirmed cases is mandatory
4. Attempt to be made to provide individual rooms for suspect cases
5. Every such Facility must be mapped to one or more Dedicated COVID Health Center *(DCHC)* or Dedicated COVID Hospital *(DCH)* for referral.
6. Basic Life Support Ambulance *(BSLA)* with sufficient oxygen support 24*7 to be available
7. HR may be roped-in from AYUSH doctors. *(Training protocols and trained pool available)*
Dedicated COVID Health Center (DCHC) (For Group 2 Category of cases)

1. For cases clinically assigned as moderate
2. Full hospital or a block of hospital
3. Private hospitals also can be designated
4. Hospital will have separate areas for suspect and confirmed cases
5. **Hospital to have beds with assured oxygen support**
6. Every such facility to be mapped with one or more Dedicated COVID Hospital (DCH)
7. Basic Life Support Ambulance (BLSA) with sufficient oxygen support for ensuring safe transport
1. For cases clinically assigned as **severe**

2. Full hospital or a separate block in hospital

3. Private hospitals also can be designated

4. **Hospitals to have ICUs, ventilator and beds with oxygen**

5. Hospitals will have separate areas for suspect and confirmed cases

6. These Facilities are referrals centers for CCCs and DCHCs
Categorization of Patients

1. Mild and very Mild Cases
2. Moderate Cases
3. Severe Cases
Mild and very Mild Cases (CCC)

1. Cases with Fever and upper respiratory tract illness
2. Patients will be accommodated in Dedicated COVID Care Centers (CCC)
3. Patients will be tested for COVID 19 and till that time, they remain in ‘suspected cases’ section
4. Patients tested positive will be moved to ‘confirmed cases’ section
5. If tests are negative, patient will be given symptomatic treatment and discharged with prescribed medication
6. If any patients qualifies as moderate or severe, will be sifted to Dedicated higher facility (DCHC or DCH)
Moderate Cases (DCHC)

1. Pneumonia with no signs of severe disease (SpO2 90-94%)

2. Cases with above symptoms to be referred directly and admitted in the Dedicated COVID Health Centers (DCHC)

3. Allopathic doctors in DCHCs will assess severity as per Protocols

4. Till test results are declared, suspect Cases will be kept in ‘suspect case’ section of DCHCs

5. Patients tested positive will be shifted to ‘confirmed cases’ section

6. Patients tested negative will be shifted to non COVID hospital for further management.

7. If any patient qualifies as severe, case will be shifted to Dedicated COVID Hospital (DCH)
Severe Cases (DCH)

1. Severe Pneumonia (respirator rate > 30/min and SpO2 < 90%) or ARDS or Septic shock

2. Cases with above symptoms to be referred directly and admitted in the Dedicated COVID Hospitals (DCH) till test results are obtained

3. Patients tested positive will remain in ICU and receive treatment as per standard treatment protocol
SIRS (Systemic Inflammatory Response Syndrome)

Two or more of:
- Temperature $>38^\circ\text{C}$ or $<36^\circ\text{C}$
- Heart rate $>90$/$\text{min}$
- Respiratory rate $>20$/$\text{min}$ or $\text{PaCO}_2 <32$ mm Hg (4.3 kPa)
- White blood cell count $>12,000$/$\text{mm}^3$ or $<4,000$/$\text{mm}^3$ or $>10\%$ immature bands
- **Brain**  
  - confusion, lethargy, coma
- **Lungs**  
  - hypoxemia, acute respiratory distress syndrome
- **Cardiovascular**  
  - hypotension, hypoperfusion, shock
- **Kidney**  
  - oliguria, elevated creatinine, acute kidney injury
- **Liver**  
  - transaminitis, elevated bilirubin
- **Gastrointestinal**  
  - ileus
- **Hematologic**  
  - coagulopathy, thrombocytopenia
- **Lactic acidosis**
Algorithm for Isolation of Cases

Suspect cases directly reporting to COVID dedicated facility.

Suspect COVID-19 Case

Mild and very mild
(Fever/URTI)

Admit to “Suspect case” section of COVID CARE CENTER (hotels/lodges/hostels/stadiums)

Test all for COVID-19

Positive
Discharge & symptomatic management

Negative
Shift to “Confirmed case” section of COVID CARE CENTRE
Monitor health twice daily
Shift to DCHC or CDH if necessary

Moderate
(Pneumonia with no signs of severe disease)
(RR 15 to 30/min, SpO2 90%-94%)

Admit to “Suspect case” section of DEDICATED COVID HEALTH CENTRE

Test all for COVID-19

Positive
Shift to non-COVID hospital/block and manage according to clinical assessment
Discharge as per clinical assessment

Negative
Shift to “Confirmed case” section of DEDICATED COVID HEALTH CENTRE
Monitor for clinical severity
Shift to CDH if necessary

Severe
(Respiratory rate ≥30/min, SpO2 < 90% in room air)

Admit to DEDICATED COVID HOSPITAL with ICU facility

Test all for COVID-19

Positive
Manage according to clinical assessment
Observing all infection prevention and control practices
Shift to non-COVID hospital/block when patient becomes stable
Discharge as per clinical assessment

Negative
Patient to remain in COVID-19 ICU

Screening at Fever Clinics

Test all for COVID-19

Positive
Manage according to clinical assessment

Negative
Patient to remain in COVID-19 ICU

Test all for COVID-19

Positive
Manage according to clinical assessment

Negative
Patient to remain in COVID-19 ICU

Test all for COVID-19

Positive
Manage according to clinical assessment

Negative
Patient to remain in COVID-19 ICU
Radiological Findings
Ashwini Hospitals

Day 1

X-Ray of COVID-19 patient at Cuttack

Day 4
We can make out air bronchograms within this meaning this represents consolidation.
There is similar opacity within the peripheral right mid zone
It is now more important than ever to review the periphery of the lung
Bilateral peripheral consolidation should make you consider COVID-19 infection
Look at these small lucencies within the opacification - these are ‘air bronchograms’

This means we can definitely call this consolidation
Learning Points

Carefully assess CXRs for peripheral consolidation during the COVID-19 pandemic.

Remember COVID-19 can present as abdominal pain.
There is bilateral peripheral opacification.
Note the central lung is relatively spared (white arrow) compared with the outer lung (yellow arrow)
Given severe abdominal pain, an abdominal CT was performed - this was normal.
Bilateral peripheral consolidation should now make you consider COVID-19
Chest CT confirms the Chest X-Ray abnormality - there is bilateral peripheral ground-glass opacity characteristic of COVID-19.
If we look at the periphery of the left lung we can see inferior border of the scapula here...
COVID-19
CXR Review Areas

- Check apices for pneumothorax and incidental tumour
- Central consolidation?
- Tubes and lines in place?
- Central consolidation?
- Invert the film
- Check behind the heart for consolidation

Difference to previous films?

- Check lung periphery
  - Caution with overlying soft tissue
- Pleural effusion?
- Can you see hemidiaphragms clearly?
- Pleural effusion?
But below this there is increased opacity
Lung USG

AIIMS, New Delhi
COVID-19 pneumonia: ARDS or not?

Luciano Gattinoni\textsuperscript{1*}, Davide Chiumello\textsuperscript{2} and Sandra Rossi\textsuperscript{3}

Fig. 1 In these 2 patients were recorded the following variables: type 1 lung weight (1192 g), gas volume (2774 ml), percentage of non-aerated tissue (8.4%), venous admixture (56%), P/F (68), and respiratory system compliance (80 ml/cmH\textsubscript{2}O); type 2 lung weight (1441 g), gas volume (1640 ml), percentage of non-aerated tissue (39%), venous admixture (49%), P/F (61), and respiratory system compliance (43 ml/cmH\textsubscript{2}O)
**COVID-19 pneumonia: different respiratory treatments for different phenotypes?**

Luciano Gattinoni1, Davide Chiumello2, Pietro Caironi2,4, Mattia Busana1, Federica Romitti1, Luca Brazzi5 and Luigi Camporota6

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**Fig. 1** A CT scan acquired during spontaneous breathing. The cumulative distribution of the CT number is shifted to the left (well-aerated compartments), being the 0 to –100 HU compartment, the non-aerated tissue virtually 0. Indeed, the total lung tissue weight was 1108 g, 7.8% of which was not aerated and the gas volume was 4228 ml. Patient receiving oxygen with venturi mask inspired oxygen fraction of 0.8. B CT acquired during mechanical ventilation at end-expiratory pressure at 5 cmH2O of PEEP. The cumulative distribution of the CT scan is shifted to the right (non-aerated compartments), while the left compartments are greatly reduced. Indeed, the total lung tissue weight was 2744 g, 54% of which was not aerated and the gas volume was 1360 ml. The patient was ventilated in volume controlled mode, 7.8 ml/kg of tidal volume, respiratory rate of 20 breaths per minute, inspired oxygen fraction of 0.7.

PaO2/FiO2 95 mmHg

PaO2/FiO2 84 mmHg
Treatment Protocols
Drugs

• Hydroxychloroquine
• Azithromycin
• Anti virals
• Immuno modulators- Taclizumab
• Steroids
• Anti coagulation
• Vitamin C
• Plasma therapy
• Ulinastatin
Early Supportive Therapy and Monitoring

ANTIMICROBIALS

- Empiric administration covering like pathogens
- In sepsis introduce in first hour
- Consider CAP, HCAP, Sepsis
- Local epidemiology, susceptibility data
- Can cover Neuraminidase inhibitor for influenza

CONSERVATIVE FLUID MANAGEMENT
IF NO SHOCK
Early Supportive Therapy and Monitoring

CORTICOSTEROIDS

- Not routinely advised
- No survival benefits (SARS)

- Adverse effects –
  - Avascular necrosis,
  - Psychosis,
  - Diabetes and
  - Delayed vial clearance.
Hydroxychloroquine

- Prophylactic – 400mg BD on day 1 followed by 400mg once a week for 6 weeks
  *Therapeutic - 400mg BD followed by 200mg BD for 5 -7 days.
  Evolving evidence .
- ICMR , USA
Azithromycin

• Being used
• Atypical Pneumonias
• Combination with HCQ is an issue
• QT prolongation with arrythmias
• Quinolones and Doxycycline ……
Anti virals

- Lopinavir, Ritonavir, Oseltamivir
- Being used
*Moderate to Severe ARDS got 20mg IV Dexa for D1-5, 10mg OD for D6-10.

- Reduced ventilator free days and all cause mortality
- What do we do?
Anti coagulation

- Prothrombotic state
- Incidences of thrombo-embolic phenomenon more
- Pulmonary embolism and thrombotic events in nervous system
- More with cytokine surge
- D dimer and deranged PT, aPTT, INR , platelet count
- Anticoagulation with LMWH and unfractionated heparin
Ivermectin *in vitro* Vero cell line

**Info**
- Anti-parasitic drug with some anti-viral properties

**Study**
- Previously shown to inhibit viral replication
  - Vero cells + SARS-CoV2
  - 2h incubation
  - +ivermectin

**Outcome**
- After 24h - reduced viral RNA in supernatant
- After 48h - no viral material
Specific Therapy

Specific therapy

• NO SPECIFIC ANTIVIRALS have been proven to be effective as per currently available data. However, based on the available information (uncontrolled clinical trials), the following drugs may be considered as an off – label indication in patients with severe disease and requiring ICU management:

• Hydroxychloroquine (Dose 400mg BD – for 1 day followed by 200mg BD for 4 days) in combination with Azithromycin (500 mg OD for 5 days) under close monitoring including QTc interval.

• The above medication is presently not recommended for children less than 12 years, pregnant and lactating women.

• These guidelines are based on currently available information and would be reviewed from time to time as new evidence emerges.
Oxygen Therapy
Oxygen therapy

- Target Spo2 – 85-92%
- Pao2 >= 55 mmHg
- Oxygen by nasal canula / mask/ venturi mask/ Reservoir mask
  High Flow nasal canula

CPAP/ BIPAP/ NIV
Oxygen Therapy

Oxygen Canula (1-4 litres O2/min)

Face Mask – O2 4-8 litres/min

Oxygen Reservoir Mask -8-15 L/min

<table>
<thead>
<tr>
<th>Nasal Canula (O2)</th>
<th>FiO2</th>
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<tbody>
<tr>
<td>1 L</td>
<td>25%</td>
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<td>2 L</td>
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<td>3 L</td>
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<td>4 L</td>
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Disadvantage –

Increased generation of aerosols
Patient co operation
Non availability in many centres
Immuno Therapy
Convalescent Plasma Therapy

Transfuse sera of patients who have recovered

Presumed to have antibodies which may help

Evidence yet to evolve

Expert opinions. USA, UK, Kerala

Hematology support
Immuno Modulators

HLH syndrome – Histiocytic Hemo phagolytic Syndrome

Profound marrow suppression
Vaccination
Management of Septic Shock
Septic Shock

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

- **Children**: any hypotension (SBP <5th centile 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
Shock in COVID-19 – what we know so far..

• Shock in COVID –
  – 1-5% patients
  – 20-35% of ICU patients

• Type of shock!
  – Septic/cardiogenic
  – Cardiac injury 7-23% patients (China, JAMA 2020)
  – Shock (?myocarditis) as cause of death in 40% patients in ICU (China, Int Care Med 2020)

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Management of Septic shock

- Recognize septic shock in adults when infection is suspected or confirmed AND vasopressors are needed to maintain mean arterial pressure (MAP) ≥65 mmHg AND lactate is < 2 mmol/L, in absence of hypovolemia.
- Fluid resuscitation: Adult: 30ml/kg.
- Isotonic crystalloids (NS / RL) <3hrs.
- Don’t use hypotonic crystalloids (Hydroxy ethyl starch)
- Avoid volume overload
- Administer central venous catheter & measure central venous pressure
Management of Septic shock

- Judicious use of norepinephrine, epinephrine, vasopressin, dopamine.
- Reserved dopamine for selected patients with low risk of tachyarrhythmia or bradycardia.
- Monitor: MAP, Urine output >0.5ml/kg per hour.
  - Skin mottling, consciousness, lactate.
Other therapeutic measures: to decrease the body’s inflammatory response, glucocorticoids can be used for a short period of time (3 to 5 days).
- Dose should not exceed the equivalent of methylprednisolone 1 – 2mg/kg/day.
- Larger dose of glucocorticoid will delay the removal of coronavirus due to immunosuppressive effects.
Volume status - IVC
Early supportive therapy and monitoring

- Use **conservative fluid management** in patients with SARI when there is no evidence of shock.
- Patients with SARI should be treated cautiously with intravenous fluids, because aggressive fluid resuscitation may worsen oxygenation, especially in settings where there is limited availability of mechanical ventilation.
Early supportive therapy and monitoring

• Closely monitor patients with SARI for signs of clinical deterioration, such as rapidly progressive respiratory failure and sepsis, and apply supportive care interventions immediately.

• Application of timely, effective, and safe supportive therapies is the cornerstone of therapy for patients that develop severe manifestations of nCoV.
Early supportive therapy and monitoring

• Understand the patient’s co-morbid condition(s) to tailor the management of critical illness and appreciate the prognosis

• During intensive care management of SARI, determine which chronic therapies should be continued and which therapies should be stopped temporarily

• Communicate early with patient and family

• Communicate proactively with patients and families and provide support and prognostic information

• Understand the patient’s values and preferences regarding life-sustaining interventions
Admit in Hospital when..

- Tachypnea (RR>24/min)
- SpO$_2$ < 94% on room air (PaO$_2$/FiO$_2$ <300)
- Signs of hypoperfusion
  - Low BP, altered mentation
- Risk of severe disease
  - Age >60
  - DM, HTN, immunocompromised
  - Chronic lung/cardiac/renal/hepatic disease

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Who gets admitted to ICU?

- Tachypnea/ Resp distress
- Requiring oxygen
- Low BP
- Altered sensorium
- Other organ dysfunction - Acute kidney Injury, Hepatitis, coagulopathy.
Unique features

- Cytokine storm
- Flooding of the lungs with bilateral peripheral opacities
- Necrotic lungs
- Profound vasodilatation
- Leukopenia
- High Ferritin and CRP
- High D dimer …in order of thousands
- AKI
Prognosis:

- Case Fatality Rate: 2.3%
- Maximum Death Age Group: >60 years
- Maximum Death Comorbidity: Hypertension 6%, Diabetes 6%, CVD 10%, Cancer 5%, COPD 6%
- M – F mortality: 2.8 to 1.7%

SARS (10%)
MERS (37%)
Poor prognostic marker:

- Bacterial and Fungal co-infection
- Old age, Obesity & presence of comorbidity
- MuLBSTA score >12 predictor of mortality
  - Multilobar infiltration: 5 points
  - Lymphopenia (lymphocytes) <0.8 x 10^9: 4 points
  - Bacterial co-infection: 4 points
  - Smoking History: Acute smoker: 3 points
    Quit smoker: 2 points
- Hypertension: 2 points
- Age >60 years: 2 points
Cause of mortality

- Cytokine storm
- Secondary Sepsis
- Co morbidities
- Immunosuppressed
- Lack of timely intervention
Thank you