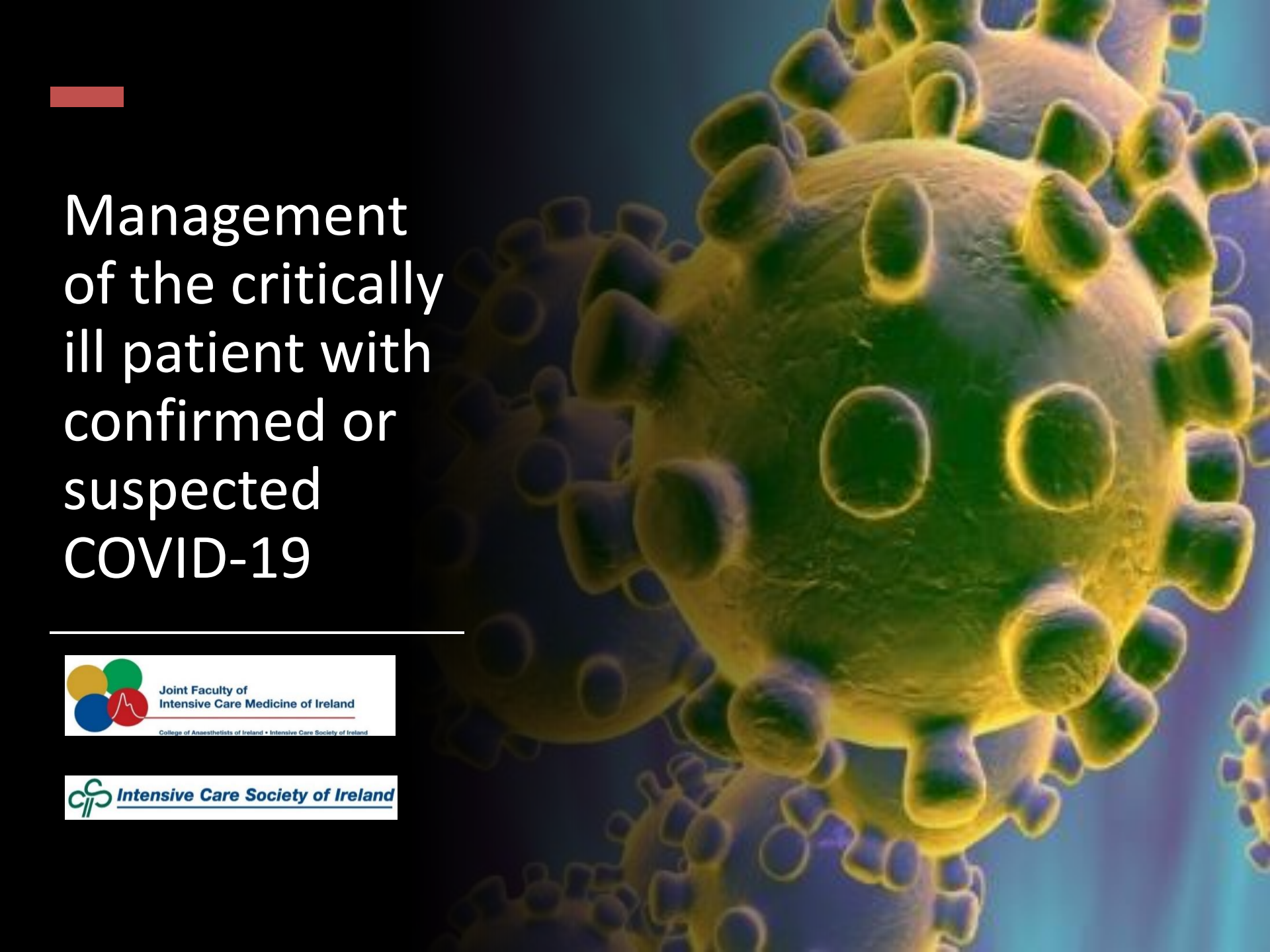
# Management of the critically ill patient with confirmed or suspected COVID-19



Joint Faculty of Intensive Care Medicine of Ireland

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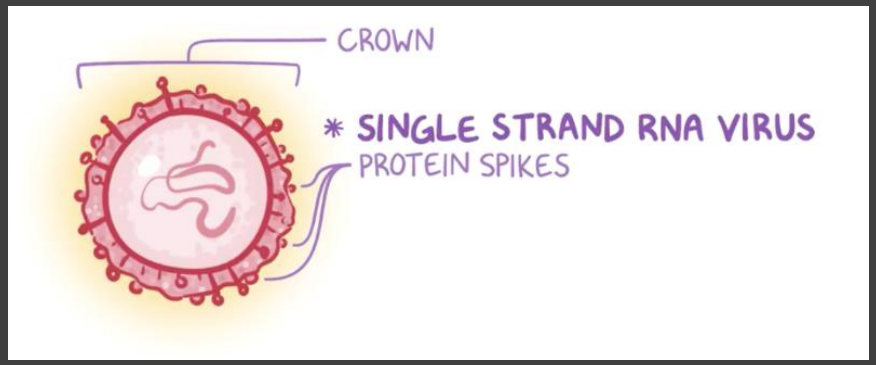
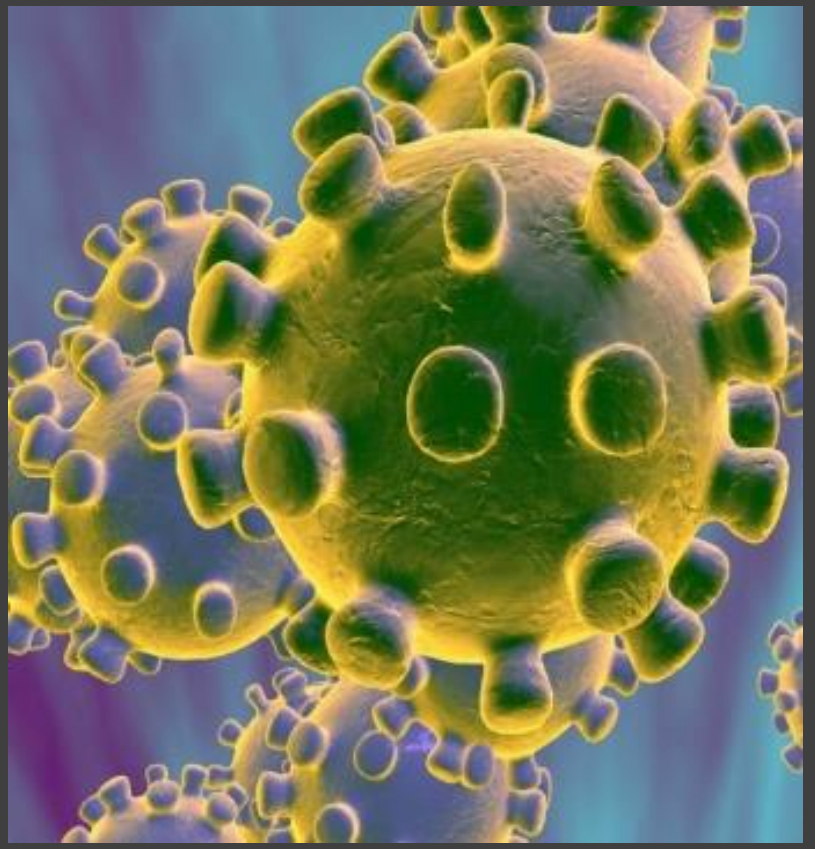
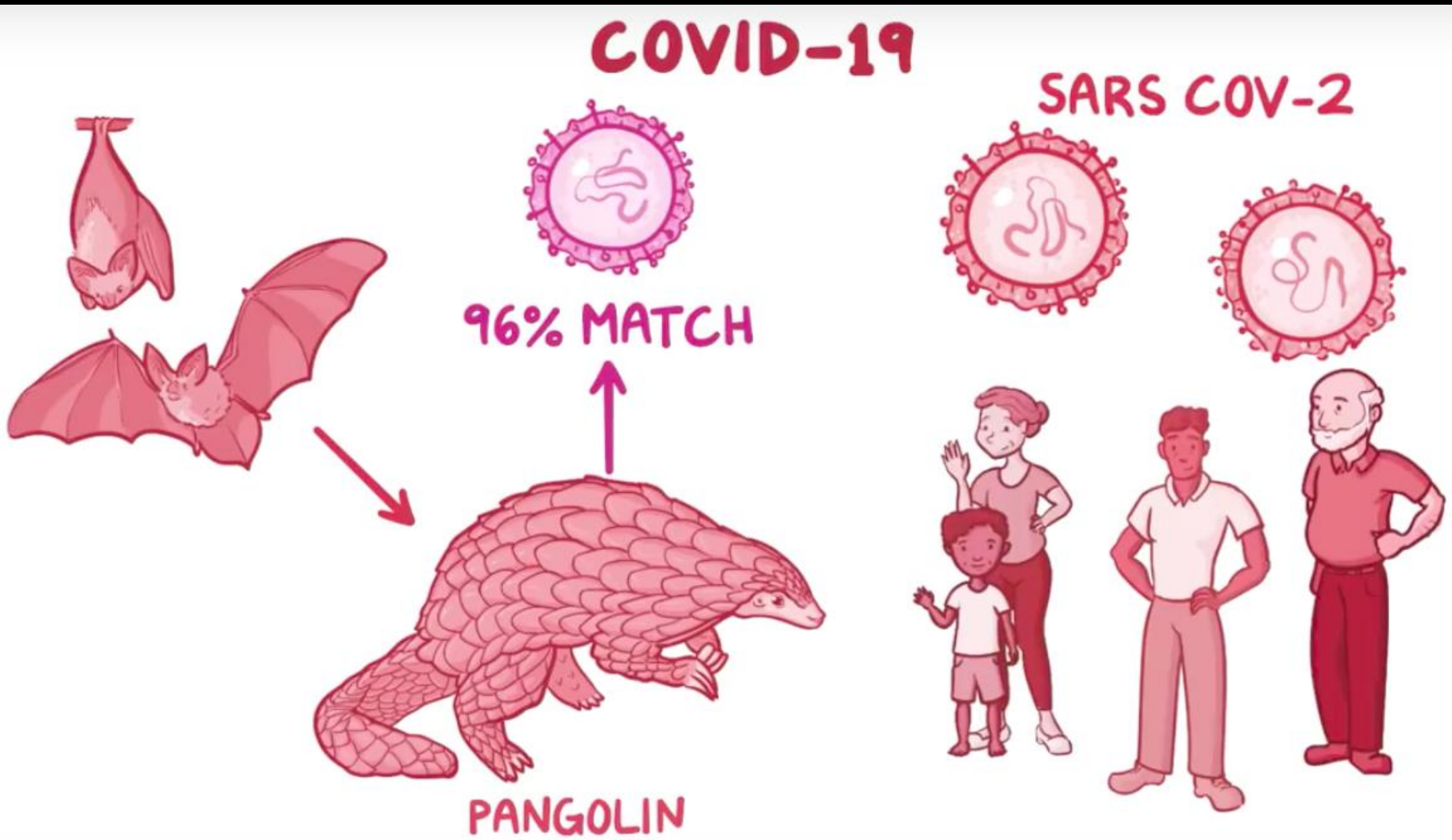
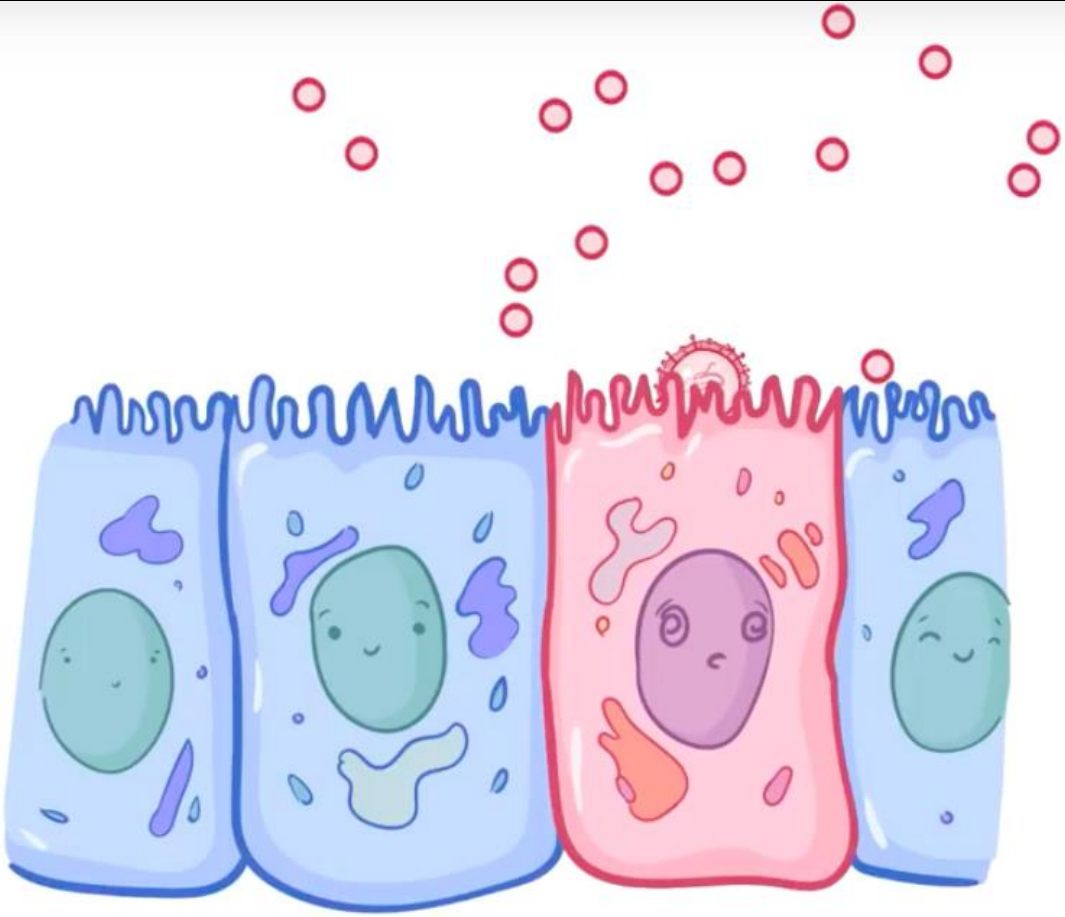
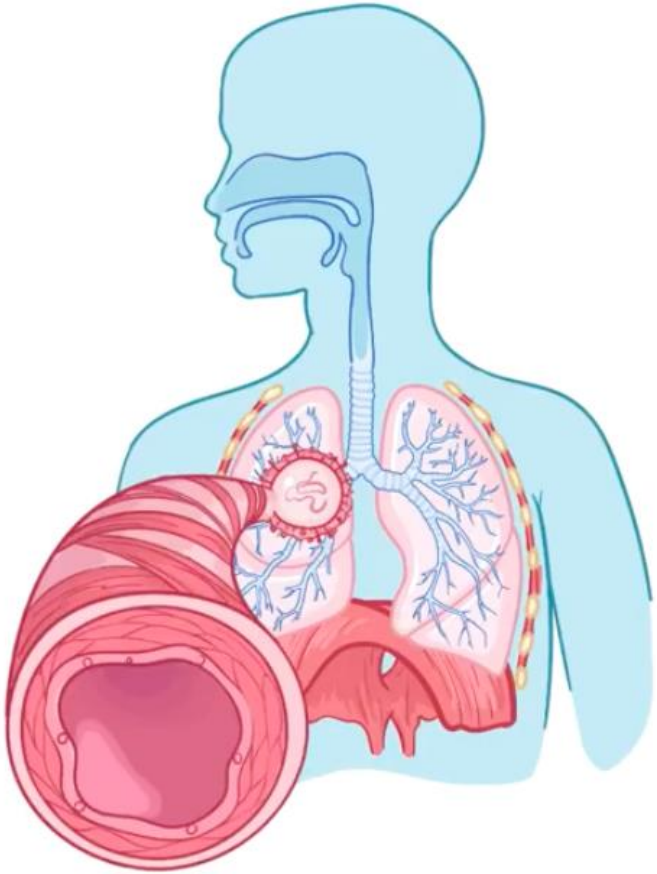


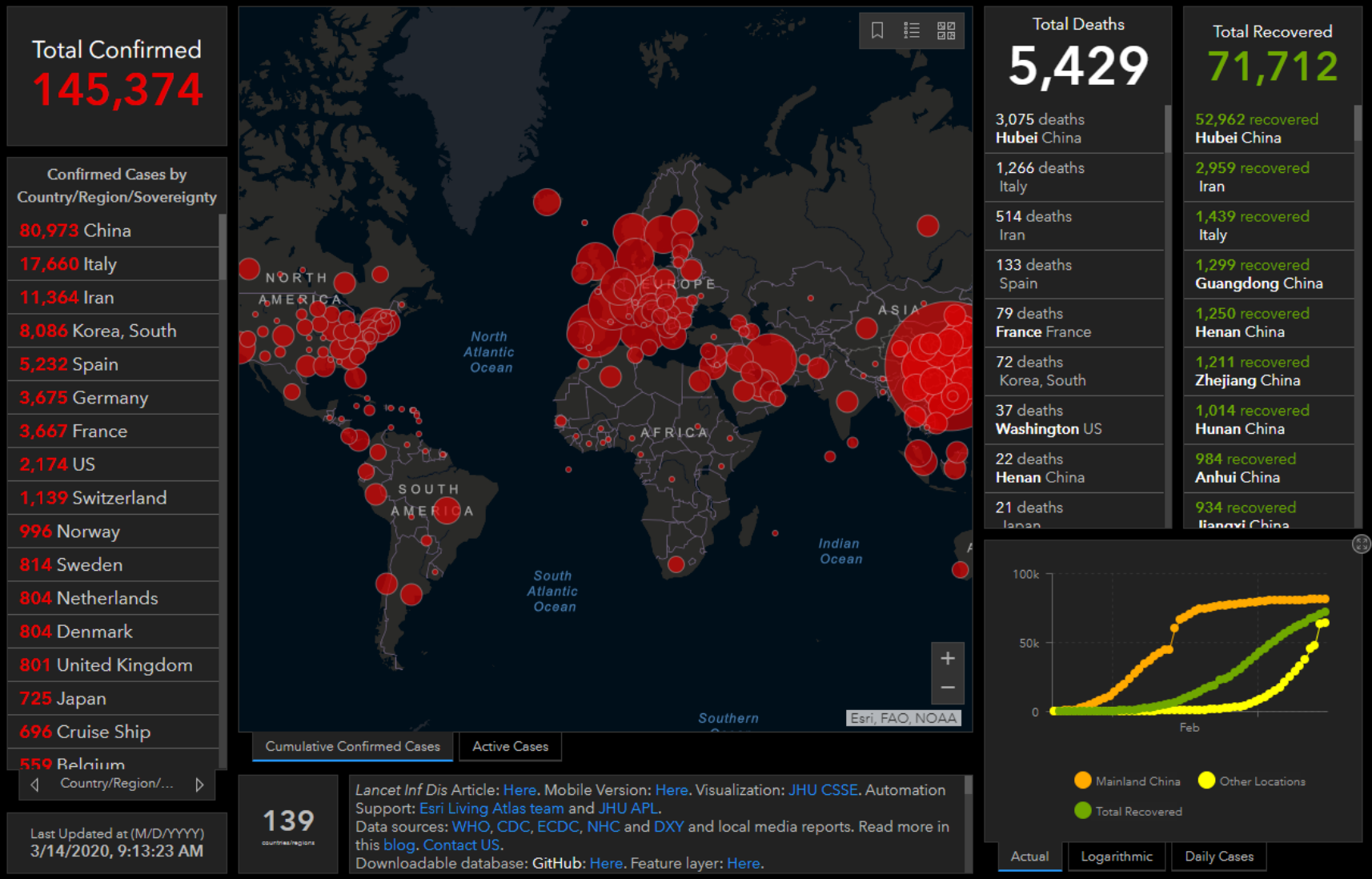



Virus: SARS-CoV-2
Disease: COVID-19


COVID-19
SARS COV-2
96% MATCH
PANGOLIN





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Sat 14th March

# Coronavirus COVID-19 Global Cases by the Center for Systems Science and Engineering (CSSE) at Jo…

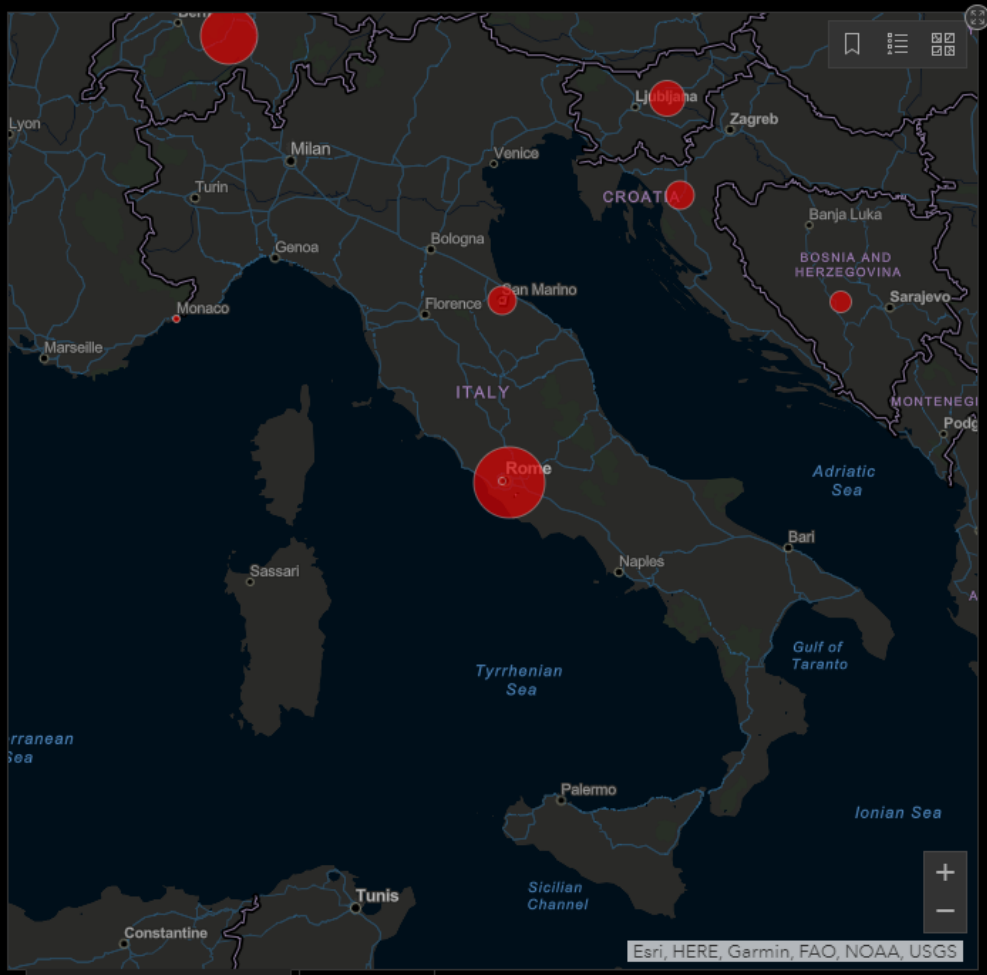
## Total Confirmed
**17,660**

### Confirmed Cases by Country/Region/Sovereignty

- 80,973 China
- 17,660 Italy
- 11,364 Iran
- 8,086 Korea, South
- 5,232 Spain
- 3,675 Germany
- 3,667 France
- 2,174 US
- 1,139 Switzerland
- 996 Norway
- 814 Sweden
- 804 Netherlands
- 804 Denmark
- 801 United Kingdom
- 725 Japan
- 696 Cruise Ship
- 559 Belgium

Country/Region/…

Last Updated at (M/D/YYYY)
**3/14/2020, 9:13:23 AM**



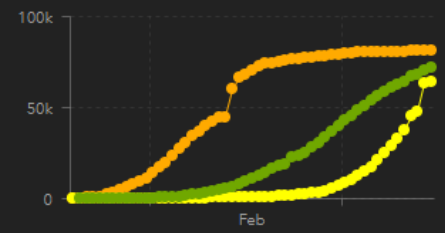

Cumulative Confirmed Cases | Active Cases

## Total Deaths
**1,266**

1,266 deaths
Italy

## Total Recovered
**1,439**

1,439 recovered
Italy

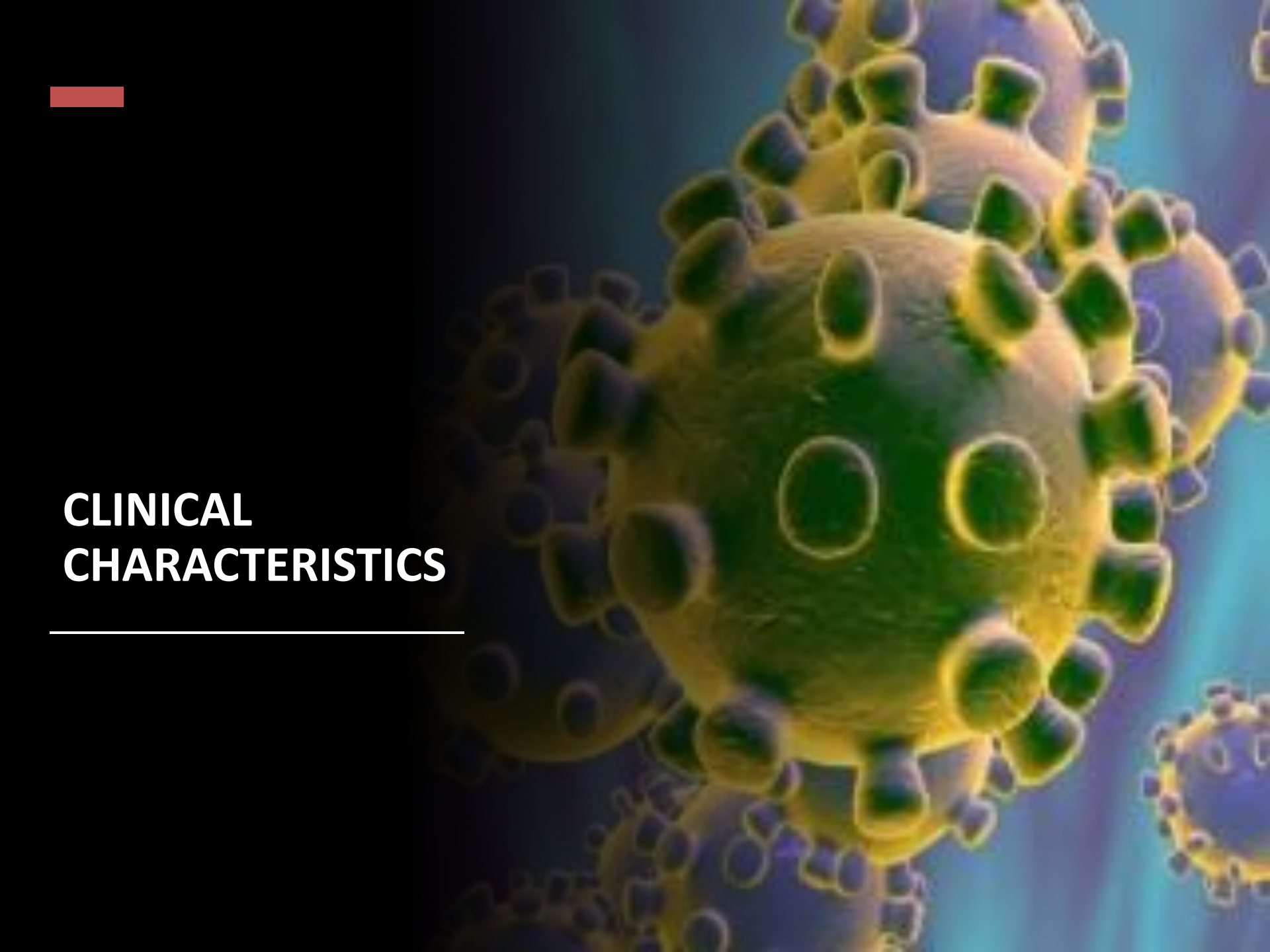



Actual | Logarithmic | Daily Cases

**139**
countries/regions

*Lancet Inf Dis* Article: Here. Mobile Version: Here. Visualization: JHU CSSE. Automation Support: Esri Living Atlas team and JHU APL.
Data sources: WHO, CDC, ECDC, NHC and DXY and local media reports. Read more in this blog. Contact US.
Downloadable database: GitHub: Here. Feature layer: Here.

# CLINICAL CHARACTERISTICS



BRIEF REPORT

# A Novel Coronavirus from Patients with Pneumonia in China, 2019

Na Zhu, Ph.D., Dingyu Zhang, M.D., Wenling Wang, Ph.D., Xingwang Li, M.D., Bo Yang, M.S., Jingdong Song, Ph.D., Xiang Zhao, Ph.D., Baoying Huang, Ph.D., Weifeng Shi, Ph.D., Roujian Lu, M.D., Peihua Niu, Ph.D., Faxian Zhan, Ph.D., Xuejun Ma, Ph.D., Dayan Wang, Ph.D., Wenbo Xu, M.D., Guizhen Wu, M.D., George F. Gao, D.Phil., and Wenjie Tan, M.D., Ph.D., for the China Novel Coronavirus Investigating and Research Team

SUMMARY

In December 2019, a cluster of patients with pneumonia of unknown cause was linked to a seafood wholesale market in Wuhan, China. A previously unknown betacoronavirus was discovered through the use of unbiased sequencing in samples from patients with pneumonia. Human airway epithelial cells were used to isolate a novel coronavirus, named 2019-nCoV, which formed a clade within the subgenus sarbecovirus, Orthocoronavirinae subfamily. Different from both MERS-CoV and SARS-CoV, 2019-nCoV is the seventh member of the family of coronaviruses that infect humans. Enhanced surveillance and further investigation are ongoing. (Funded by the National Key Research and Development Program of China and the National Major Project for Control and Prevention of Infectious Disease in China.)

From the NHC Key Laboratory of Biosafety, National Institute for Viral Disease Control and Prevention, Chinese Center for Disease Control and Prevention (N.Z., W.W., X.M., D.W., the Departm Beijing Dit University ( han Jinyint sion for Vir Provincial C Prevention Biosafety M my of Scie and the Sh sity and Sh

EMERGING AND REEMERGING PATHOGENS ARE GLOBAL CHALLENGES FOR

# Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China

Chaolin Huang*, Yeming Wang*, Xingwang Li*, Lili Ren*, Jianping Zhao*, Yi Hu*, Li Zhang, Guohui Fan, Jiuyang Xu, Xiaoying Gu, Zhenshun Cheng, Ting Yu, Jiaan Xia, Yuan Wei, Wenjuan Wu, Xuelei Xie, Wen Yin, Hui Li, Min Liu, Yan Xiao, Hong Gao, Li Guo, Jungang Xie, Guangfa Wang, Rongmeng Jiang, Zhancheng Gao, Qi Jin, Jianwei Wang†, Bin Cao†

**Summary**

**Background** A recent cluster of pneumonia cases in Wuhan, China, was caused by a novel betacoronavirus, the 2019 novel coronavirus (2019-nCoV). We report the epidemiological, clinical, laboratory, and radiological characteristics and treatment and clinical outcomes of these patients.

**Methods** All patients with suspected 2019-nCoV were admitted to a designated hospital in Wuhan. We prospectively collected and analysed data on patients with laboratory-confirmed 2019-nCoV infection by real-time RT-PCR and next-generation sequencing. Data were obtained with standardised data collection forms shared by WHO and the International Severe Acute Respiratory and Emerging Infection Consortium from electronic medical records. Researchers also directly communicated with patients or their families to ascertain epidemiological and symptom data. Outcomes were also compared between patients who had been admitted to the intensive care unit (ICU) and those who had not.

**Findings** By Jan 2, 2020, 41 admitted hospital patients had been identified as having laboratory-confirmed 2019-nCoV infection. Most of the infected patients were men (30 [73%] of 41); less than half had underlying diseases (13 [32%]), iabetes (eight [20%]), hypertension (six [15%]), and cardiovascular disease (six [15%]). Median age was IQR 41·0–58·0), 27 (66%) of 41 patients had been exposed to Huanan seafood market. One family cluster Common symptoms at onset of illness were fever (40 [98%] of 41 patients), cough (31 [76%]), and myalgia or [44%]); less common symptoms were sputum production (11 [28%] of 39), headache (three [8%] of 38), s (two [5%] of 39), and diarrhoea (one [3%] of 38). Dyspnoea developed in 22 (55%) of 40 patients (median llness onset to dyspnoea 8·0 days [IQR 5·0–13·0]). 26 (63%) of 41 patients had lymphopenia. All 41 patients onia with abnormal findings on chest CT. Complications included acute respiratory distress syndrome tNAaemia (six [15%]), acute cardiac injury (five [12%]) and secondary infection (four [10%]). 13 (32%) patients ed to an ICU and six (15%) died. Compared with non-ICU patients, ICU patients had higher plasma levels IL10, GSCF, IP10, MCP1, MIP1A, and TNFα.

on The 2019-nCoV infection caused clusters of severe respiratory illness similar to severe acute respiratory oronavirus and was associated with ICU admission and high mortality. Major gaps in our knowledge of pidemiology, duration of human transmission, and clinical spectrum of disease need fulfilment by future

Lancet 2020; 395: 497–506
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This online publication has been corrected. The corrected version first appeared at thelancet.com on January 30, 2020
See Comment pages 469 and 470

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Original Investigation

March 3, 2020

# Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore

Barnaby Edward Young, MB, BChir[1,2,3]; Sean Wei Xiang Ong, MBBS[1,2]; Shirin Kalimuddin, MPH[4,5]; et al
Author Affiliations | Article Information

JAMA. Published online March 3, 2020. doi:10.1001/jama.2020.3204

ONLINE FIRST FREE

COVID-19 Resource Center

Related Articles

## Key Points

**Question** What was the initial experience in Singapore with the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)?

**Findings** In this descriptive case series of the first 18 patients diagnosed with SARS-CoV-2 infection in Singapore between January 23 and February 3, 2020, clinical presentation was a respiratory tract infection with prolonged viral shedding from the nasopharynx of 7 days or longer in 15 patients (83%). Supplemental oxygen wa

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Viewpoint

February 24, 2020

More

# Characteristics of and Important Lessons Fr Coronavirus Disease 2019 (COVID-19) Outbreak in China

## Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention

Zunyou Wu, MD, PhD[1]; Jennifer M. McGoogan, PhD[1]
Author Affiliations | Article Information

JAMA. Published online February 24, 2020. doi:10.1001/jama.2020.2648

中文 (chinese) COVID-19 Resource Center

Related Articles

The Chinese Center for Disease Control and Prevention recently published the largest case series to date of coronavirus disease 2019 (COVID-19) in mainland China (72 314 cases, updated through February 11, 2020).[1] This Viewpoint summarizes key findings from this report and discusses emerging understanding of and lessons from the COVID-19 epidemic.

Epidemiologic Charac

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ORIGINAL ARTICLE

# Clinical Characteristics of Coronavirus Disease 2019 in China

W. Guan, Z. Ni, Yu Hu, W. Liang, C. Ou, J. He, L. Liu, H. Shan, C. Lei, D.S.C. Hui, B. Du, L. Li, G. Zeng, K.-Y. Yuen, R. Chen, C. Tang, T. Wang, P. Chen, J. Xiang, S. Li, Jin-lin Wang, Z. Liang, Y. Peng, L. Wei, Y. Liu, Ya-hua Hu, P. Peng, Jian-ming Wang, J. Liu, Z. Chen, G. Li, Z. Zheng, S. Qiu, J. Luo, C. Ye, S. Zhu, and N. Zhong, for the China Medical Treatment Expert Group for Covid-19*

ABSTRACT

**BACKGROUND**

Since December 2019, when coronavirus disease 2019 (Covid-19) emerged in Wuhan city and rapidly spread throughout China, data have been needed on the clinical characteristics of the affected patients.

**METHODS**

We extracted data regarding 1099 patients with laboratory-confirmed Covid-19 from 552 hospitals in 30 provinces, autonomous regions, and municipalities in mainland China through January 29, 2020. The primary composite end point was admission to an intensive care unit (ICU), the use of mechanical ventilation, or death.

**RESULTS**

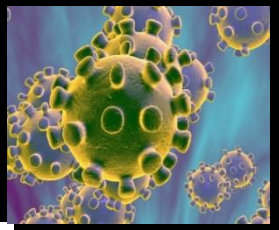
The median age of the patients was 47 years; 41.9% of the patients were female. The primary composite end point occurred in 67 patients (6.1%), including 5.0% who were admitted to the ICU, 2.3% who underwent invasive mechanical ventila-

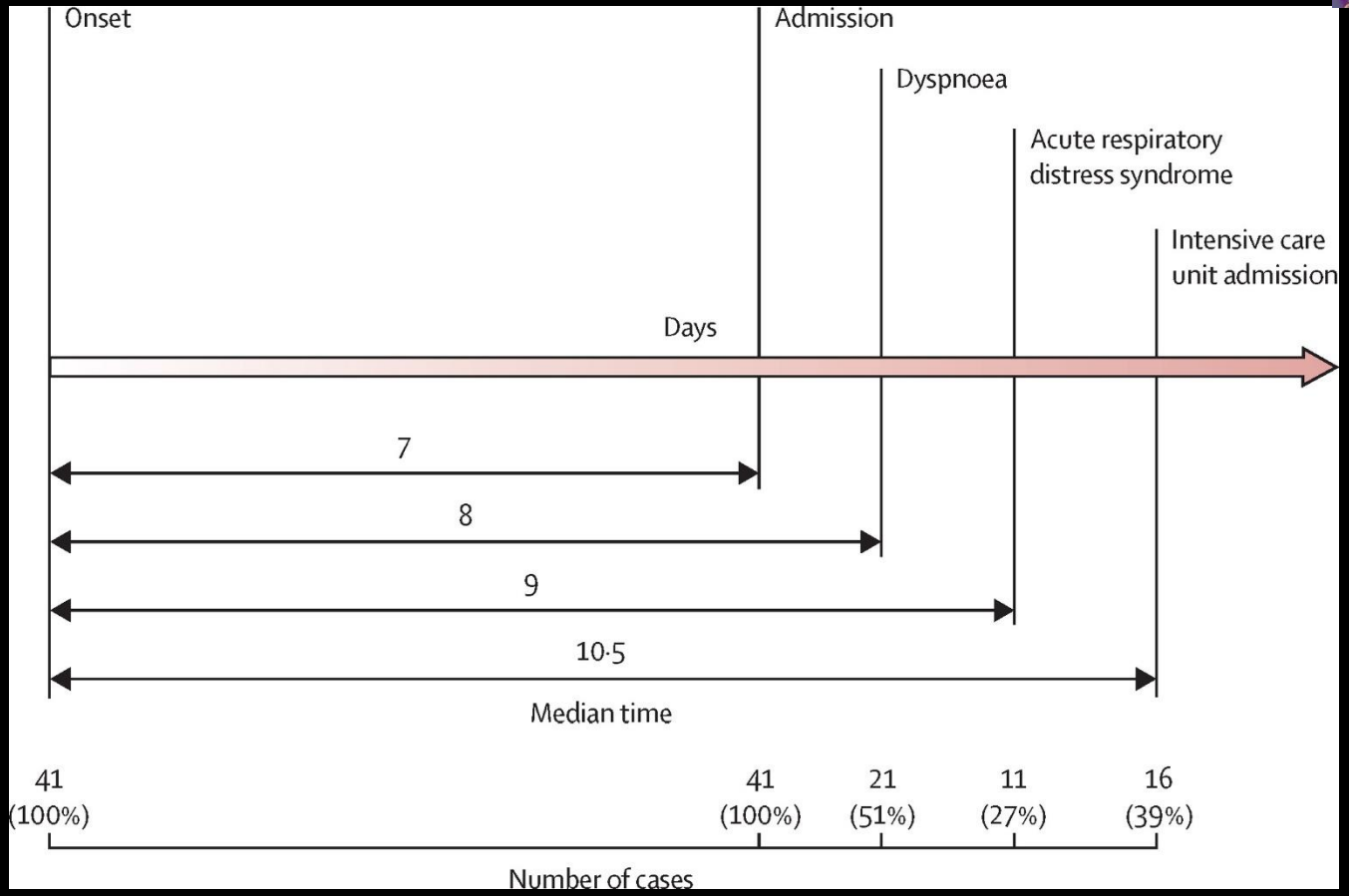
The authors' full names, academic degrees, and affiliations are listed in the Appendix. Address reprint requests to Dr. Zhong at the State Key Laboratory of Respiratory Disease, National Clinical Research Center for Respiratory Disease, Guangzhou Institute of Respiratory Health, First Affiliated Hospital of Guangzhou Medical University, 151 Yanjiang Rd., Guangzhou, Guangdong, China, or at nanshan@vip.163.com.

*A list of investigators in the China Medical Treatment Expert Group for Covid-19 study is provided in the Supplementary Appendix, available at NEJM.org.

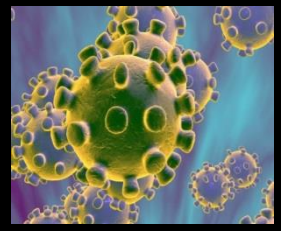
Drs. Guan, Ni, Yu Hu, W. Liang, Ou, He,

# Figure 2






*The Lancet* 2020 395, 497-506DOI: (10.1016/S0140-6736(20)30183-5)

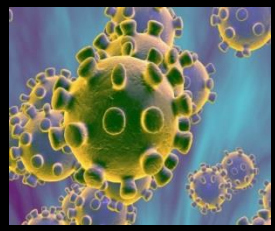


| | All patients (n=41) | ICU care (n=13) | No ICU care (n=28) | p value |
|---|---|---|---|---|
| **Signs and symptoms** | | | | |
| Fever | 40 (98%) | 13 (100%) | 27 (96%) | 0·68 |
| Highest temperature, °C | .. | .. | .. | 0·037 |
| <37·3 | 1 (2%) | 0 | 1 (4%) | .. |
| 37·3–38·0 | 8 (20%) | 3 (23%) | 5 (18%) | .. |
| 38·1–39·0 | 18 (44%) | 7 (54%) | 11 (39%) | .. |
| >39·0 | 14 (34%) | 3 (23%) | 11 (39%) | .. |
| Cough | 31 (76%) | 11 (85%) | 20 (71%) | 0·35 |
| Myalgia or fatigue | 18 (44%) | 7 (54%) | 11 (39%) | 0·38 |
| Sputum production | 11/39 (28%) | 5 (38%) | 6/26 (23%) | 0·32 |
| Headache | 3/38 (8%) | 0 | 3/25 (12%) | 0·10 |
| Haemoptysis | 2/39 (5%) | 1 (8%) | 1/26 (4%) | 0·46 |
| Diarrhoea | 1/38 (3%) | 0 | 1/25 (4%) | 0·66 |
| Dyspnoea | 22/40 (55%) | 12 (92%) | 10/27 (37%) | 0·0010 |
| Days from illness onset to dyspnoea | 8·0 (5·0–13·0) | 8·0 (6·0–17·0) | 6·5 (2·0–10·0) | 0·22 |
| Days from first admission to transfer | 5·0 (1·0–8·0) | 8·0 (5·0–14·0) | 1·0 (1·0–6·5) | 0·0023 |
| Systolic pressure, mm Hg | 125·0 (119·0–135·0) | 145·0 (123·0–167·0) | 122·0 (118·5–129·5) | 0·018 |
| Respiratory rate >24 breaths per min | 12 (29%) | 8 (62%) | 4 (14%) | 0·0023 |

Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data. p values comparing ICU care and no ICU care are from $\chi^2$ test, Fisher's exact test, or Mann-Whitney U test. 2019-nCoV=2019 novel coronavirus. ICU=intensive care unit.

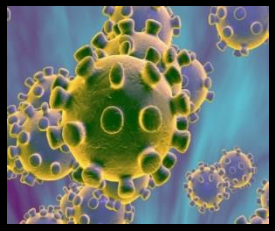
*Table 1:* **Demographics and baseline characteristics of patients infected with 2019-nCoV**

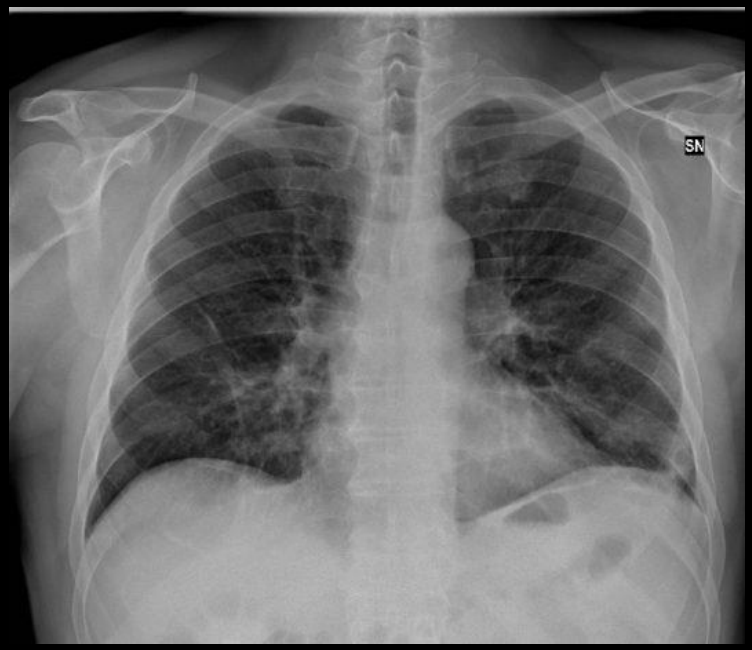
# Case definition HPSC



https://www.hpsc.ie/az/respiratory/coronavirus/novelcoronavirus/casedefinitions/

- **Case Definitions**
- This interim case definition for COVID-19 for possible cases is based on the current information available on the outbreak and may be subject to revision as new data become available.

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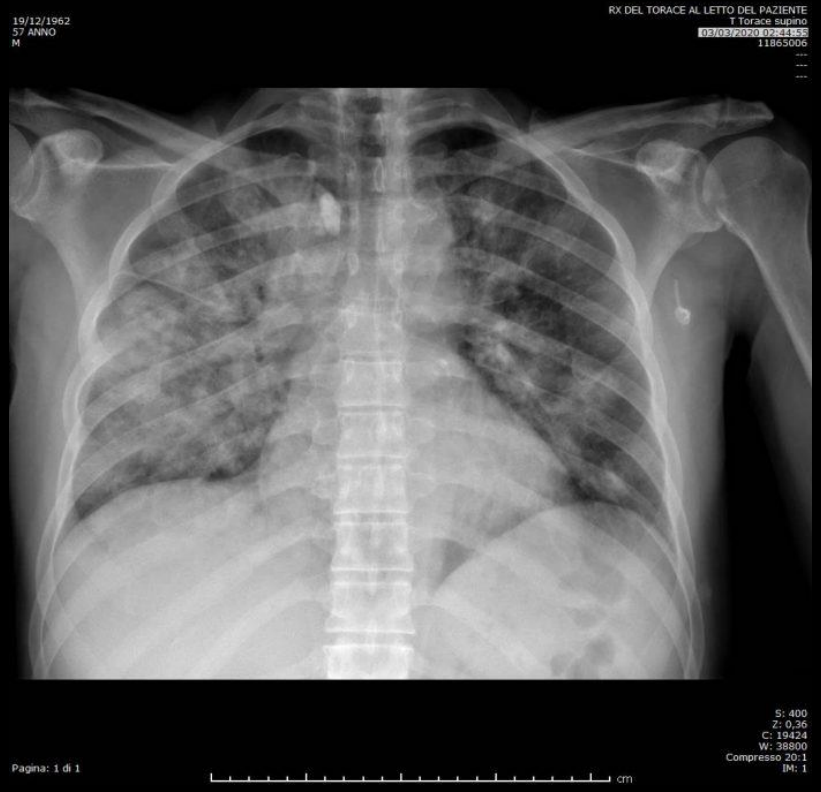
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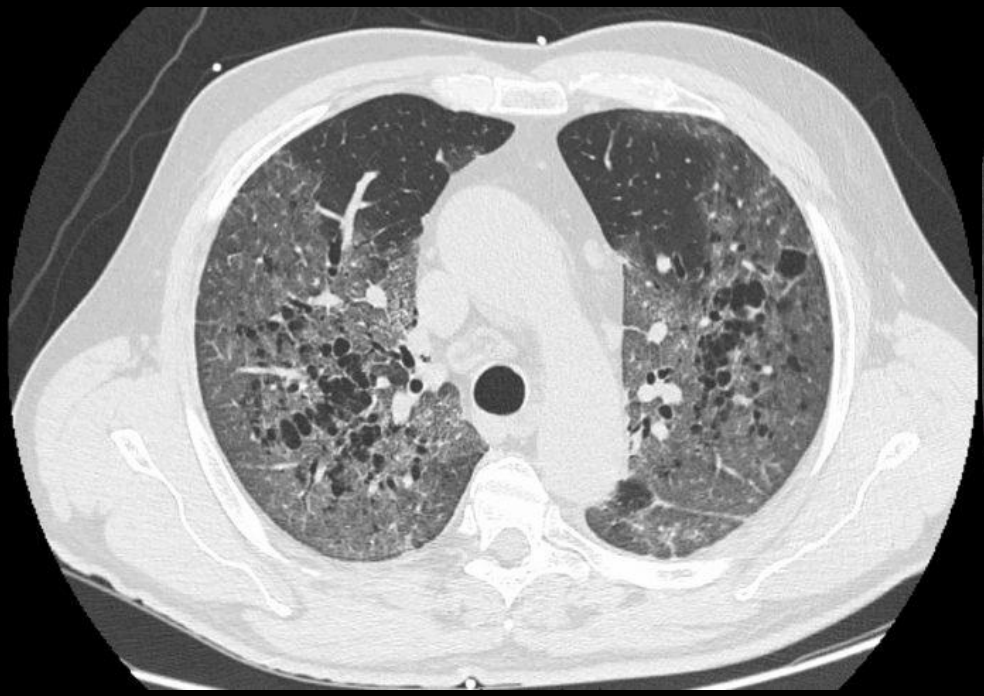


Of 1099, 975 patients had CT scan on admission

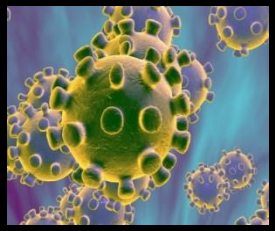
- 86.2% were abnormal
- ground-glass opacity 56.4%.

No radiographic or CT abnormality

- 17.9% with non-severe disease
- 2.9% with severe disease.

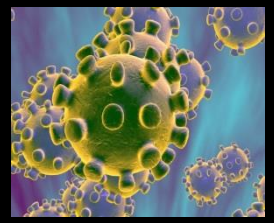
*Guan et al NEJM 2020*

# Clinical Course



- Severe Acute Respiratory Infection (SARI)
- Type I respiratory failure (often hypocapnic)
- ARDS
- Near normal compliance lungs
- Severe shunt
- Secondary Complications
  - Septic Shock
  - Acute Renal Failure
  - Myocarditis
  - Glucose abnormalities and ketoacidosis
- 7-10 days IPPV required

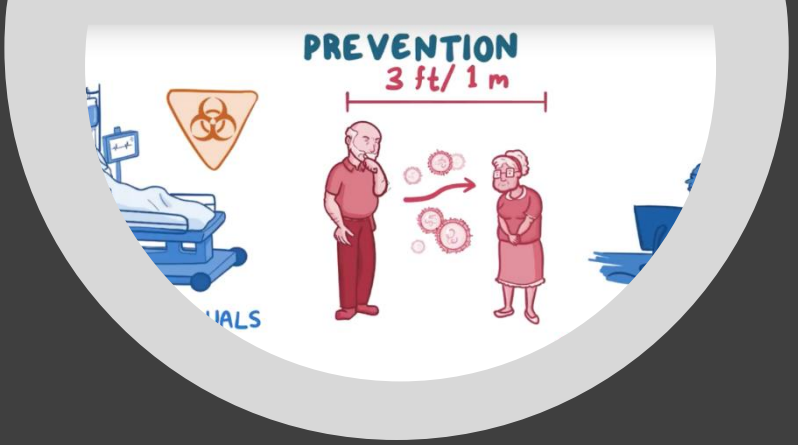
# Laboratory testing for COVID-19



- **3 Viral swabs available in a pre-prepared pack**
  - **1 nasopharyngeal swab and**
  - **2 throat swabs in viral transport medium**

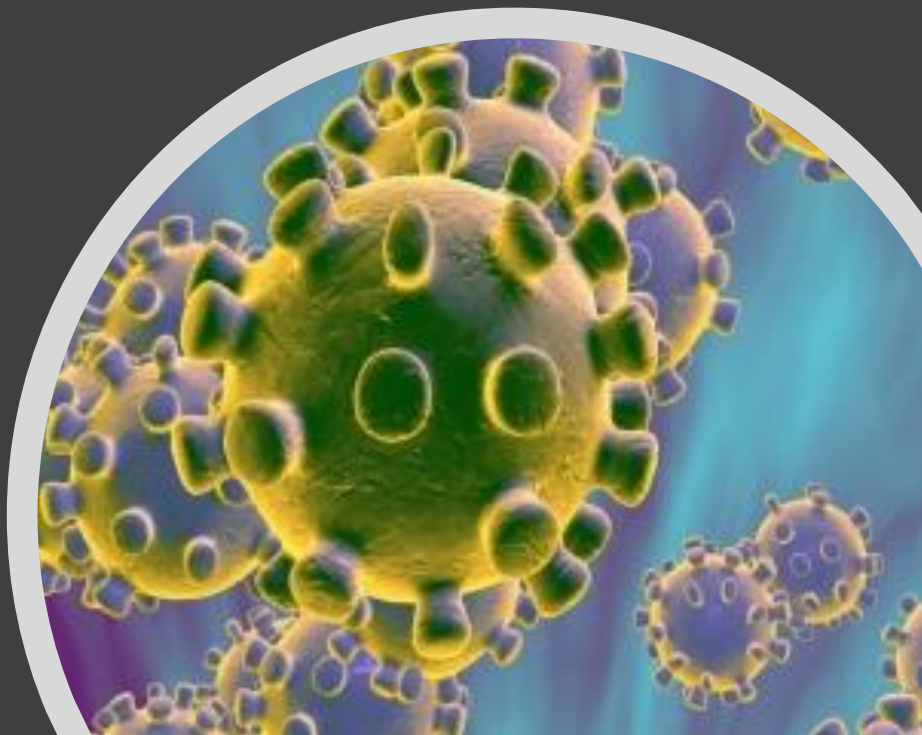
- Further samples may be indicated - e.g. **Nasopharyngeal aspirate (NPA) or Sputum or a lower respiratory tract sample (BAL)** – please discuss with on-call clinical microbiologist if necessary
- Microbiologist-on –call should be contacted if COVID-19 testing to take place.
- A single negative test result, particularly if this is from an upper respiratory tract specimen, does not exclude COVID-19
- Repeat sampling and testing, lower respiratory specimen is strongly recommended in severe or progressive disease.
- A positive alternate pathogen does not necessarily rule out COVID-19 as little is yet known about the role of co-infections.

# PREVENTION OF SPREAD

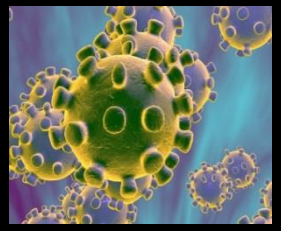



# Transmission

- Direct contact (hand to mucus membrane)
- Droplet (contact within 1m of infected patient)
- Aerosols: Smaller airborne particles which can travel around a room



# FFP3 or surgical mask (over NP)
# Mask or Non-rebreather for Transfer




# PROTECTING HCW

# Transmission within hospitals

- In one study, 41% of patients were presumed to be related to transmission within the hospital,
  - 12% patients hospitalized for other reasons
  - 29% healthcare workers

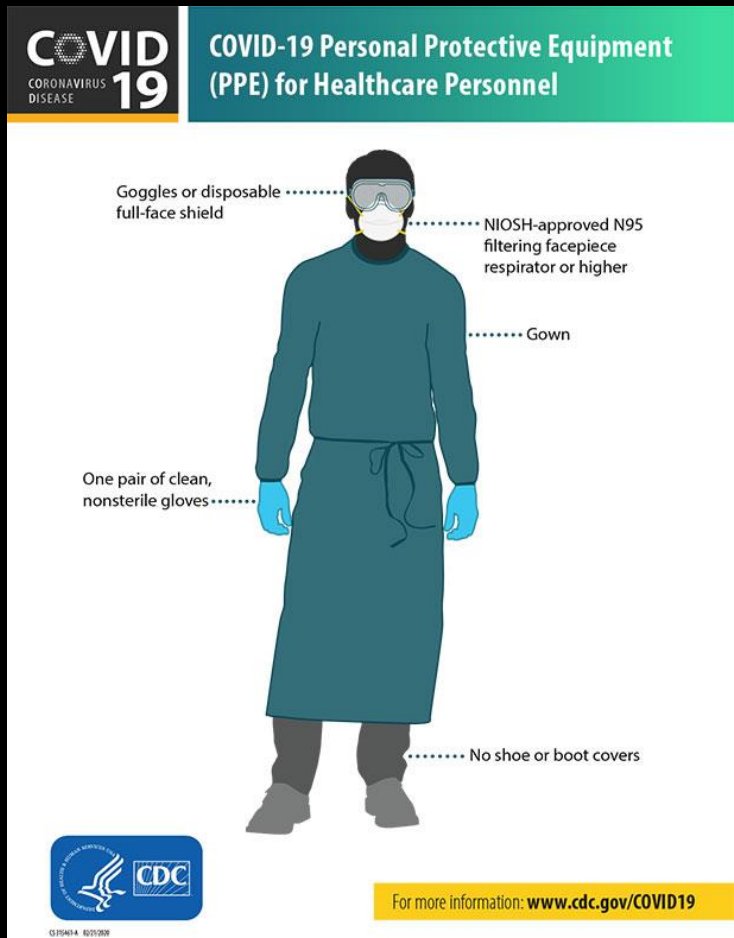
*Wang JAMA 2020*

- Health care personnel infected
  - 3.8% (1716 of 44 672)
  - 14.8% cases classified as severe or critical (247 of 1668)
  - 5 deaths

*Zunyou Wu et al JAMA 2020*

# Personal Protective Equipment

- FFP3 Filter Mask
- Visor or Goggles (glasses not sufficient)
- Long sleeved water resistant gown
- Gloves
- Hat

# Technique for Donning and Doffing of PPE

## Donning

1. **Perform Hand hygiene**
2. **Put on Gown and hat**
3. **Put on FFP3 mask**

- **Fit Check Mask**
  - Place mask over nose, mouth and chin
  - Fit flexible nose piece over nose bridge
  - Secure on head with elastic
  - Adjust to fit
  - Inhale- mask should collapse
  - Exhale- check for leakage around face
- 4. **Put on Eye Protection – goggles or face shield**

5. Put on gloves

https://www.youtube.com/watch?v=Gy4StHAHMU4

## Doffing

**In the patients' room**

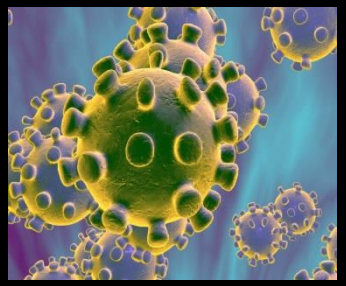
1. **Remove Gloves**
2. **Perform Hand hygiene**
3. **Remove Goggles** –avoid touching the front
4. **Remove Gown** -avoid touching the front of the apron/gown
5. **Perform Hand hygiene**

**In ante room or directly outside patients' room-**
**Ensure door is closed**

1. **Remove Mask**
   Grasp and lift ties from behind your head and pull off respirator away from your face.
   Avoid touching the front of the respirator and use ties to discard.
2. **Perform Hand hygiene**

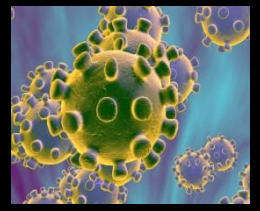
https://www.youtube.com/watch?v=pNirkWLjMX0

# Aerosol generating procedures



- Procedures that produce aerosols of respiratory secretions carry an increased risk of transmission:
  - NIV/CPAP/HFNC
  - bronchoscopy
  - induced sputum
  - positive-pressure ventilation via a face mask
  - intubation and extubation
  - airway suctioning
  - CPR

# Critical Care Equipment



- Protect respiratory equipment with a **high efficiency filter (eg BS EN 13328-1)**.
- Use disposable respiratory equipment where possible
- Decontaminate re-usable equipment in accordance with the manufacturer's instructions
- Use closed suctioning systems
- Ventilator circuits should not be broken unless necessary
- Place ventilators on standby when carrying out bagging
- Wear PPE at all times
- Consider a HME filter rather than water humidification

# FOR SUSPECTED/REPORTABLE** OR CONFIRMED CASES OF COVID-19

## BEFORE

### STAFF PROTECTION

- Hand Hygiene
- Full Personal Protective Equipment***
- Minimize Personnel During Aerosol Generating Procedures****
- Airborne Infection Isolation Room (if available)

### PREPARATION

- Early Preparation of Drugs and Equipment
- Meticulous Airway Assessment
- Use Closed Suctioning System
- Formulate plan Early
- Connect Viral/ Bacterial Filter to Circuits and Manual Ventilator
- Use Video Laryngoscopy

## DURING

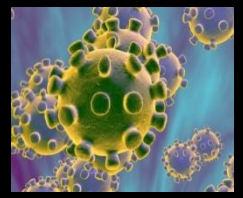
### TEAM DYNAMICS

- Clear Delineation of Roles
- Clear Communication of Airway Plan

### TECHNICAL ASPECTS

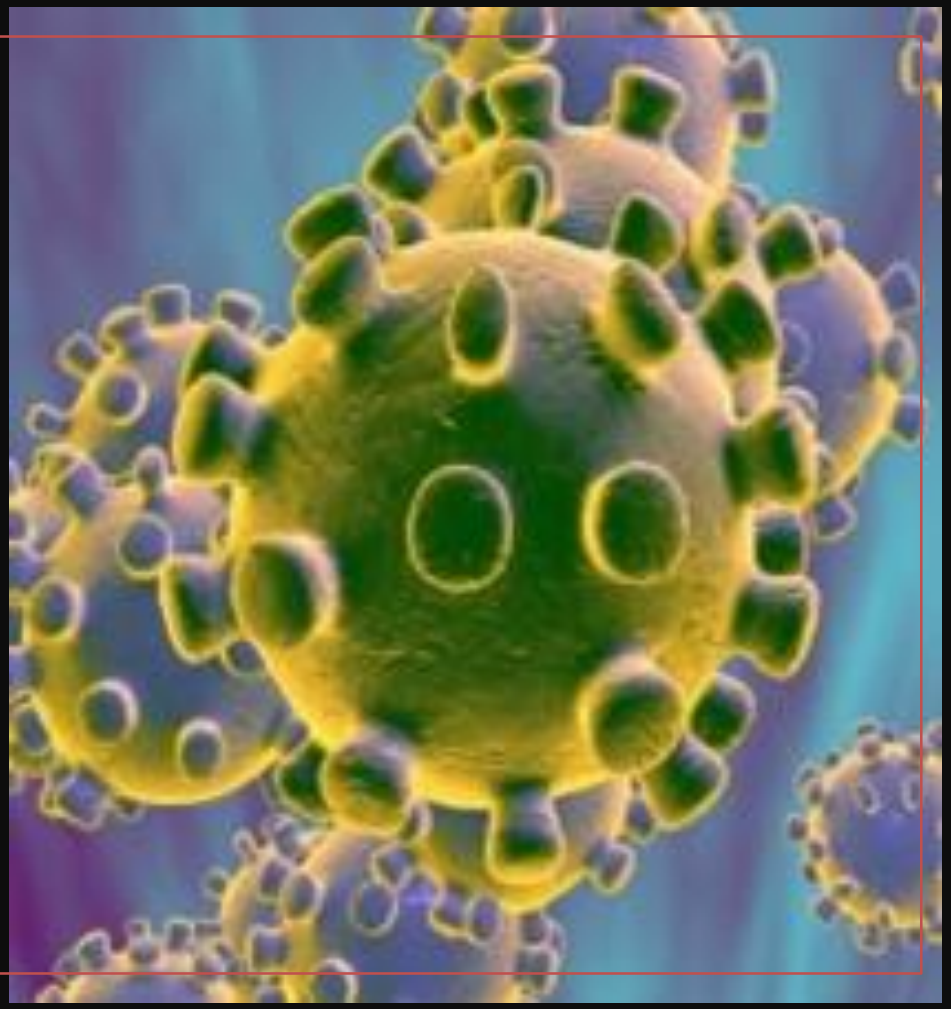
- Airway Management by Most Experienced Practitioner
- Tight Fitting Mask with Two Hand Grip to Minimise Leak
- Ensure Paralysis to Avoid Coughing

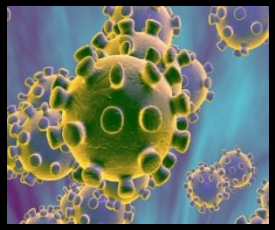
# Operating theatre



- Decisions regarding the need for surgery during the period of infectivity should be made by senior clinicians.
- Patient should be anaesthetised and recovered in the operating room
- Staff should wear appropriate PPE
- Disposable anaesthetic equipment should be used where possible
- The anaesthetic machine should be protected by a filter with **viral efficiency of 99.99%**
- Reusable anaesthetic equipment should be decontaminated as per manufacturer's instructions
- Operation room should be cleaned and disinfected after use
- **Operating room should not be used for 15 minutes after patient leaves** (based on a conventional ventilation system with 20 air changes per hour)

# TREATMENT





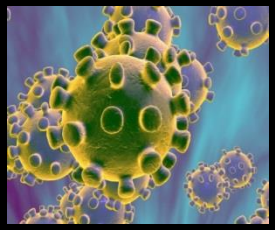
# Clinical evidence does not support corticosteroid treatment for 2019-nCoV lung injury

| | Outcomes of corticosteroid therapy* | Comment |
|---|---|---|
| MERS-CoV | Delayed clearance of viral RNA from respiratory tract[3] | Adjusted hazard ratio 0·4 (95% CI 0·2–0·7) |
| SARS-CoV | Delayed clearance of viral RNA from blood[5] | Significant difference but effect size not quantified |
| SARS-CoV | Complication: psychosis[6] | Associated with higher cumulative dose, 10 975 mg vs 6780 mg hydrocortisone equivalent |
| SARS-CoV | Complication: diabetes[7] | 33 (35%) of 95 patients treated with corticosteroid developed corticosteroid-induced diabetes |
| SARS-CoV | Complication: avascular necrosis in survivors[8] | Among 40 patients who survived after corticosteroid treatment, 12 (30%) had avascular necrosis and 30 (75%) had osteoporosis |
| Influenza | Increased mortality[9] | Risk ratio for mortality 1·75 (95% CI 1·3–2·4) in a meta-analysis of 6548 patients from ten studies |
| RSV | No clinical benefit in children[10,11] | No effect in largest randomised controlled trial of 600 children, of whom 305 (51%) had been treated with corticosteroids |

CoV=coronavirus. MERS=Middle East respiratory syndrome. RSV=respiratory syncytial virus. SARS=severe acute respiratory syndrome. *Hydrocortisone, methylprednisolone, dexamethasone, and prednisolone.

***Table:*** **Summary of clinical evidence to date**

***Russell Lancet 2020***



# Co-infections

- One small study: Among COVID-19 patients in Qingdao, 24 (80.00%) of them had IgM antibodies against at least one respiratory pathogen, compared to 20% in Wuhan.
- 6% of patients with COVID-19 tested for other viruses had other infections (coronavirus, influenza A virus, rhinovirus, and influenza A H3N2).

https://www.medrxiv.org/content/10.1101/2020.02.29.20027698v2

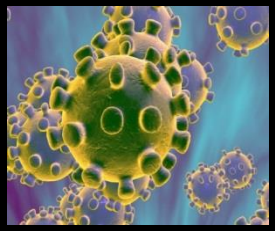
https://www.medrxiv.org/content/10.1101/2020.02.12.20022327v2

- In MERS critically ill patients, 18% had bacterial co-infections and 5% viral co-infection

***Arabi CCM 2017***

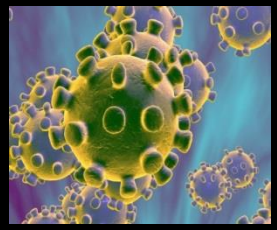
- The recent 2019 ATS/IDSA clinical practice guidelines recommend standard antibacterial therapy to be initially prescribed for adults with community-acquired pneumonia who test positive for influenza.

***Uyeki TM et al Clin Infect Dis 2019***



# Registered clinical trials

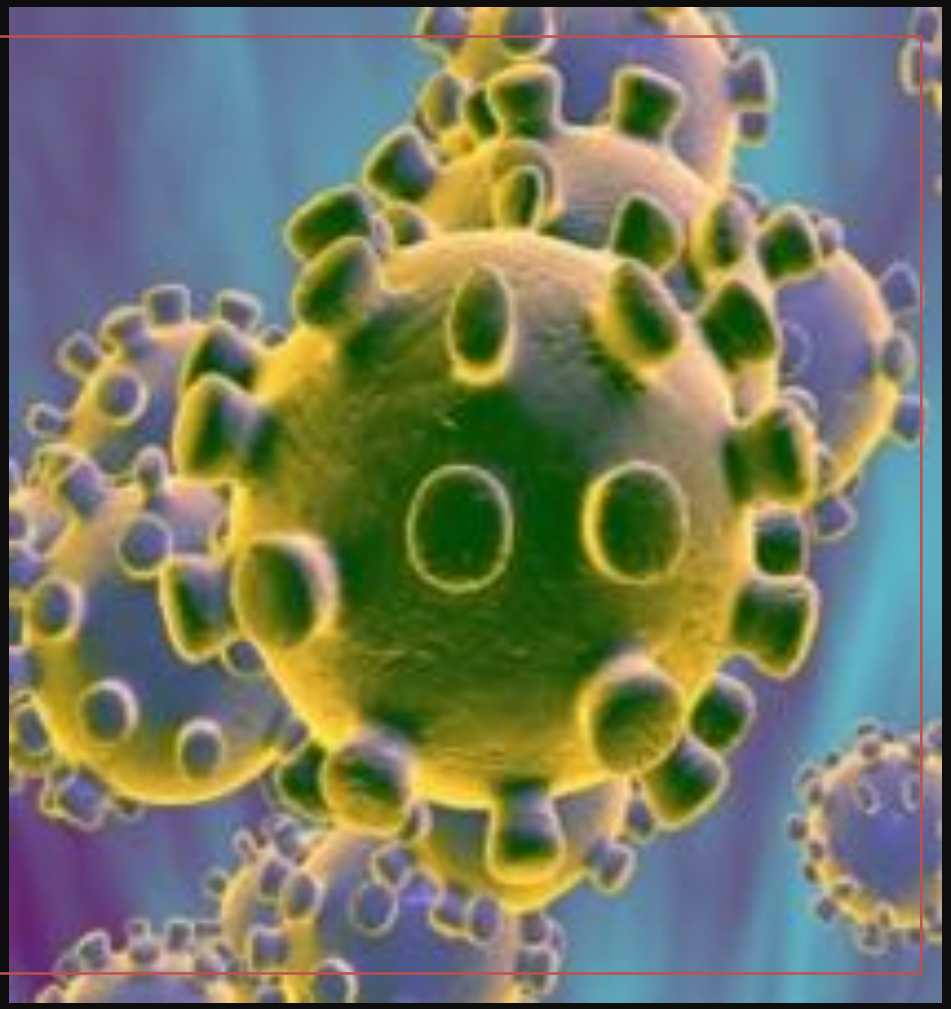
| Antivirals |
| --- |
| Remdesivir |
| Anti-retrovirals: Lopinavir-Ritonavir, Darunavir and Cobicistat , ASC09/Ritonavir |
| Anti-influenza antivirals: Arbidol, Baloxavir, Favipiravir |
| Azvudine |
| Chloroquine phosphate |
| Hydroxycholoroquine |
| Recombinant human angiotensin-converting enzyme 2 (rhACE2) |
| Ribavirin |



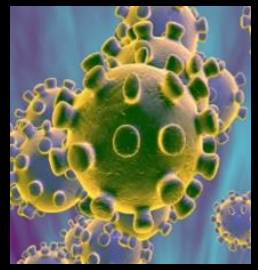
# Remdesivir

- High priority antiviral by WHO prioritizations list.
- In vitro activity against MERS-CoV, SARS-CoV and Ebola virus.
- Ongoing trials in China for severe and non-severe COVID-19 and in USA.

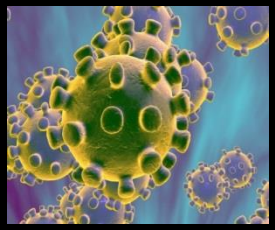
# RESPIRATORY SUPPORT



# Respiratory Support



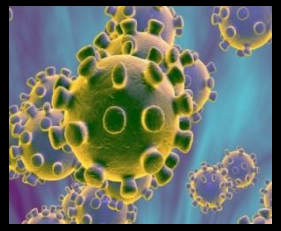
- NIV/HFNC/Mask CPAP not contraindicated but results in aerosol production-must be delivered in a negative pressure isolation room
- Most patients will have type I resp failure but require higher levels of CPAP than can be delivered with HFNC
- Helmet CPAP may be the best NI option where available
- Full face mask NIV may be an option
- The rate of failure of NIV with COVID-19 is high
- In general early IPPV is encouraged



# Use of NIV

- Selected patients in early stages and milder forms of acute hypoxemic respiratory failure.
- Avoid in shock, multiorgan failure, or large amount of secretions.
- Patients who do not show signs of early recovery, NIV may well delay but not avoid invasive ventilation.

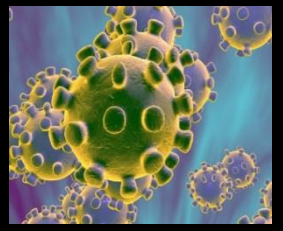
# Mechanical ventilation



- Standard protective ventilation
  - Tidal Volume 4-8 mls/kg IBW
  - Plateau pressure < 30 cm H2O
  - Driving Pressure < 15 cm H2O
  - Early NDMR if indicated
  - Appropriate PEEP
  - Prone Ventilation if indicated
  - Daily CXR may not be neccessary

https://youtu.be/qx2z26IL6g8

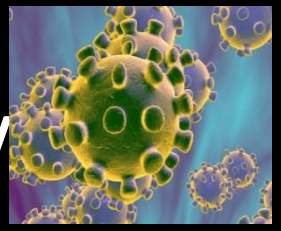
# Rescue Therapy



- NO
  - (but minimise circuit breaks)

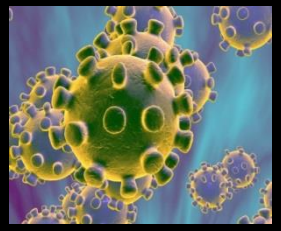

- ECMO
  - as per advice of MMH ECMO team

# Preventing Infection while on IPPV

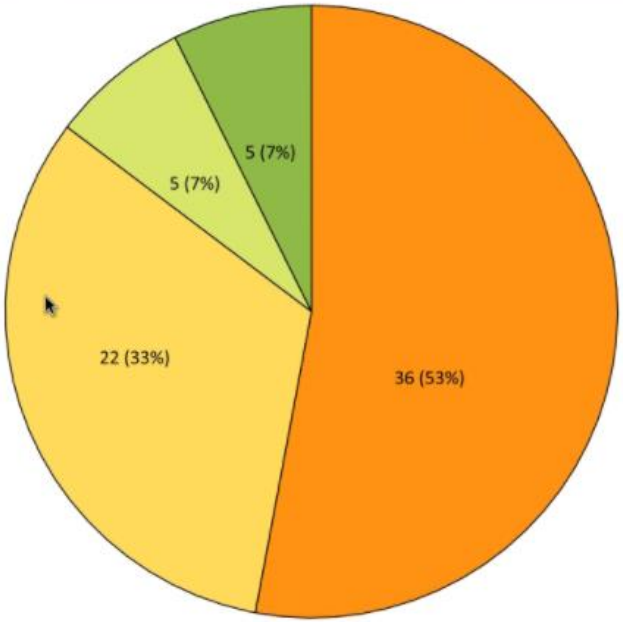


- Closed circuit suctioning
- High efficiency filter (eg BS EN 23328-1)

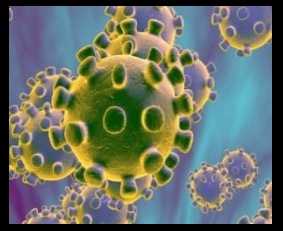
- Minimise circuit breaks
- Clamp ETT if circuit breaks neccessary



# Causes of death

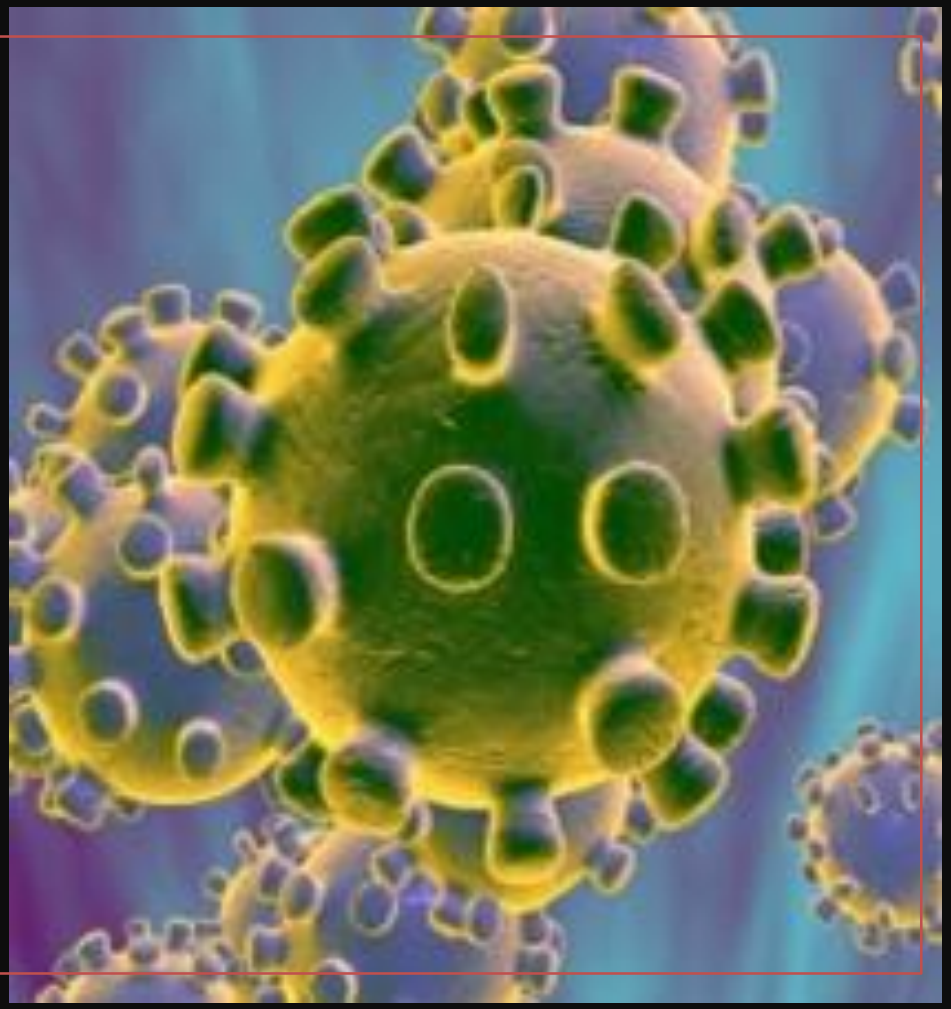


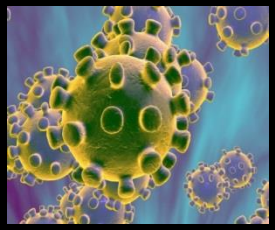
# Treatment of shock



- As per surviving sepsis guidelines
- Early use of noradrenaline
- Avoid excessive volume administration
- Treat AKI as per standard ICU patient

# OUTCOME





80% non-severe

15% severe, not critical

5% critical

Mortality

0.1%

8%

42-62%

2-3%

*Guan et al NEJM 2020*
*Yang et al Lancet Resp 2020*

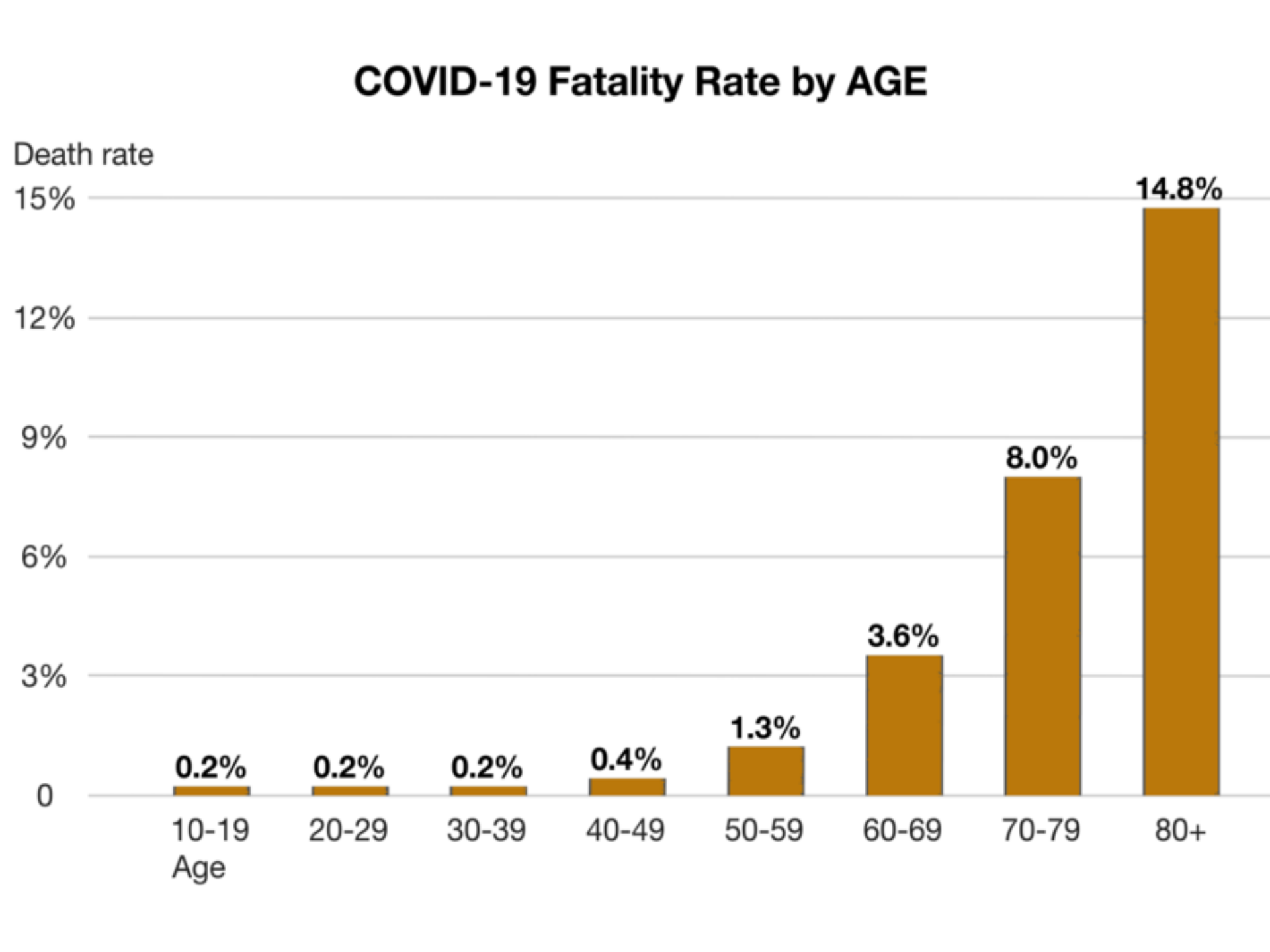
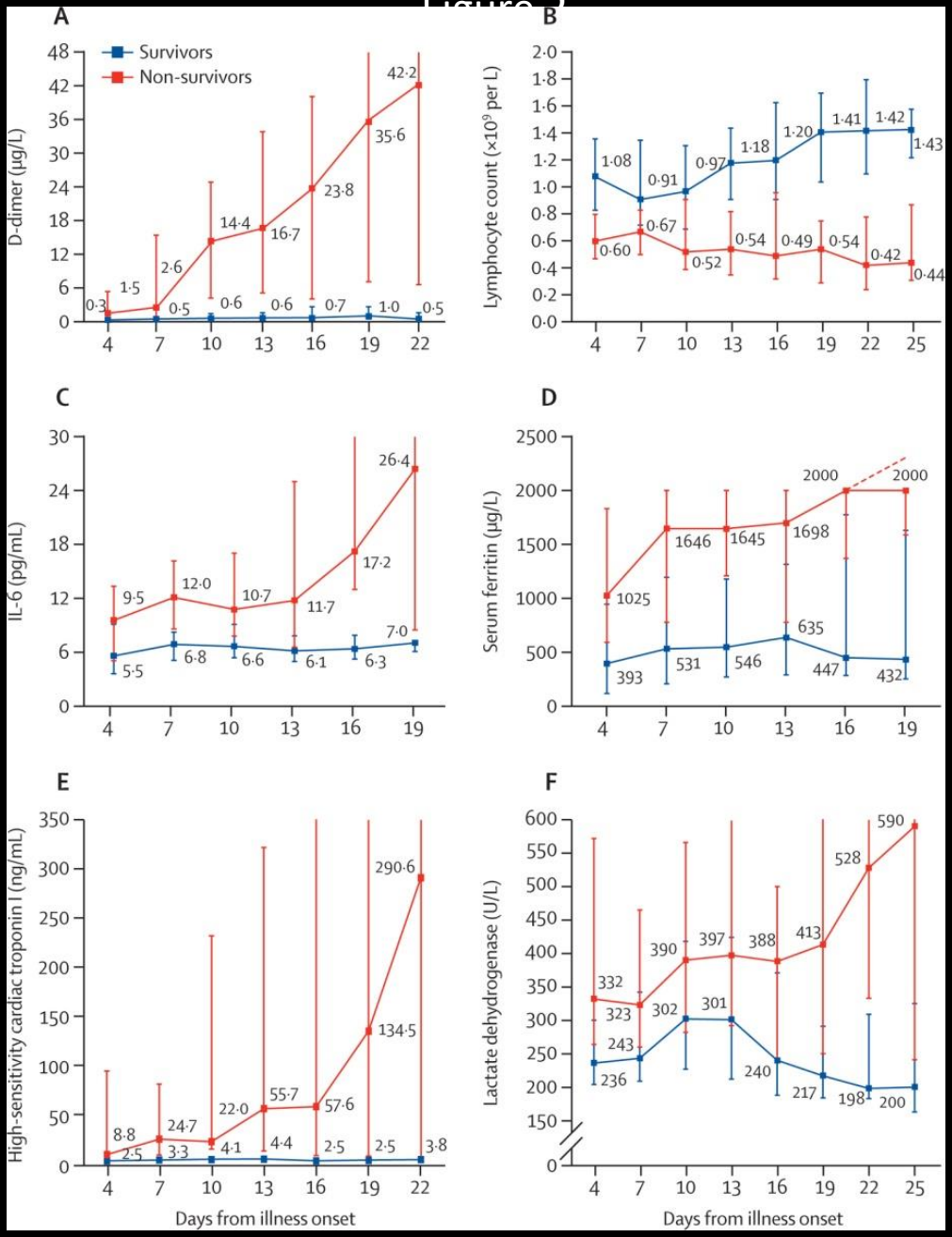
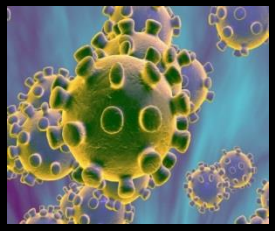

COVID-19 Fatality Rate by AGE
Death rate
15%
12%
9%
6%
3%
0
0.2%
0.2%
0.2%
0.4%
1.3%
3.6%
8.0%
14.8%
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80+
Age

Figure 2




*The Lancet* DOI: (10.1016/S0140-6736(20)30566-3)



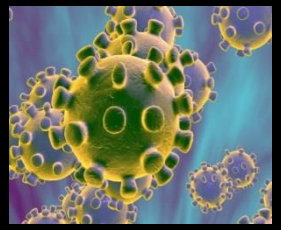
# COVID-19 IN NUMBERS

| | |
|---|---|
| PEOPLE EACH INFECTED CASE PASSES ON TO | 2–3 people |
| ASCERTAINMENT RATE | 10–25% |
| ATTACK RATE | 30–60% |
| HOSPITALISATION* | 12% |
| SYMPTOMS* | |
| Mild | 80% |
| Severe | 15% |
| Critical | 2–10% |
| MORTALITY* | 3.5% |
| INCUBATION | Up to 14 days |
| INFECTIVE | 14–24 days |

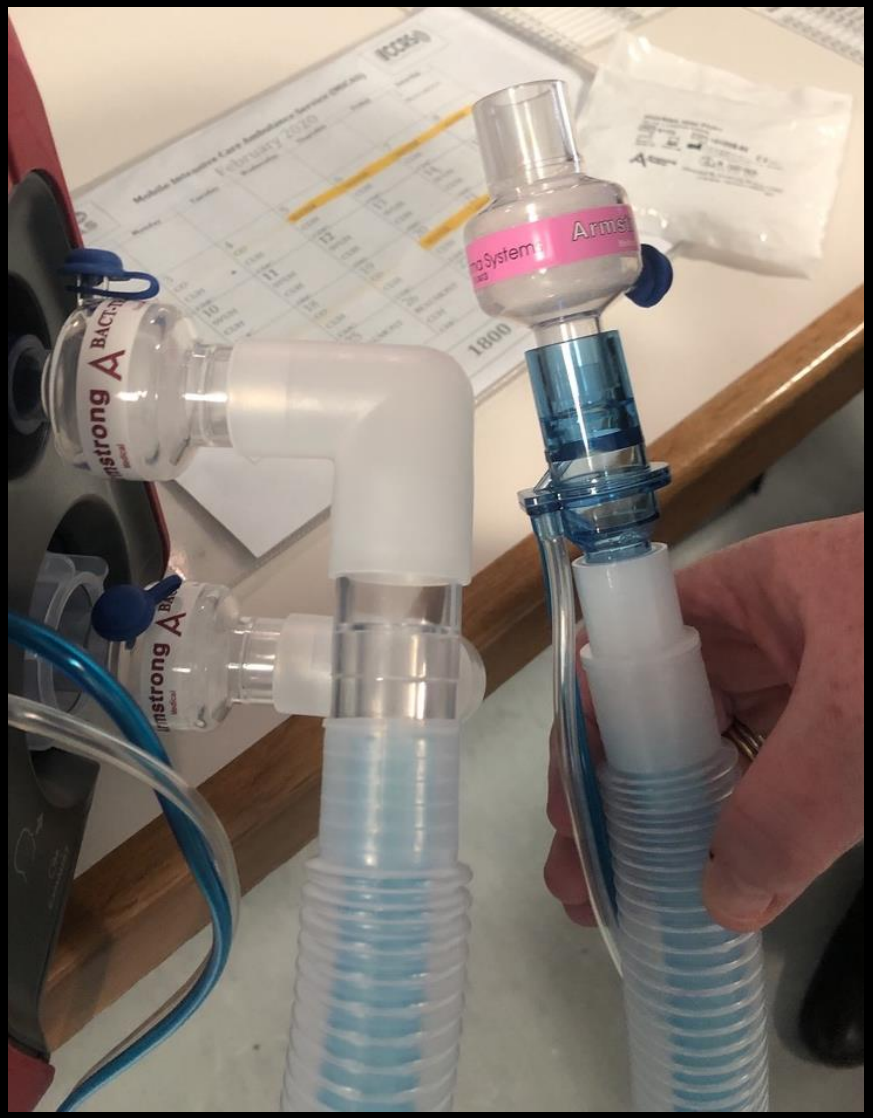
* IN THOSE IDENTIFIED

ALL DATA ARE ESTIMATES

*@doctimcook and @elboghdadly*
*Data as of 07/03/2020*



# Inter Hospital transfer and COVID-19



- May be occasionally required
- Standard inter-hospital protocols apply with additional infections prevention and control precautions (full PPE worn by all crew and appropriate ventilator tubing filters)

# Conclusions

- COVID-19 is a novel coronavirus that causes severe hypoxic respiratory failure in about 5% of cases
- Mortality is high in patients who require ICU admission
- The scale of infection will put ICU capacity under severe pressure
- There is no directed treatment or vaccine

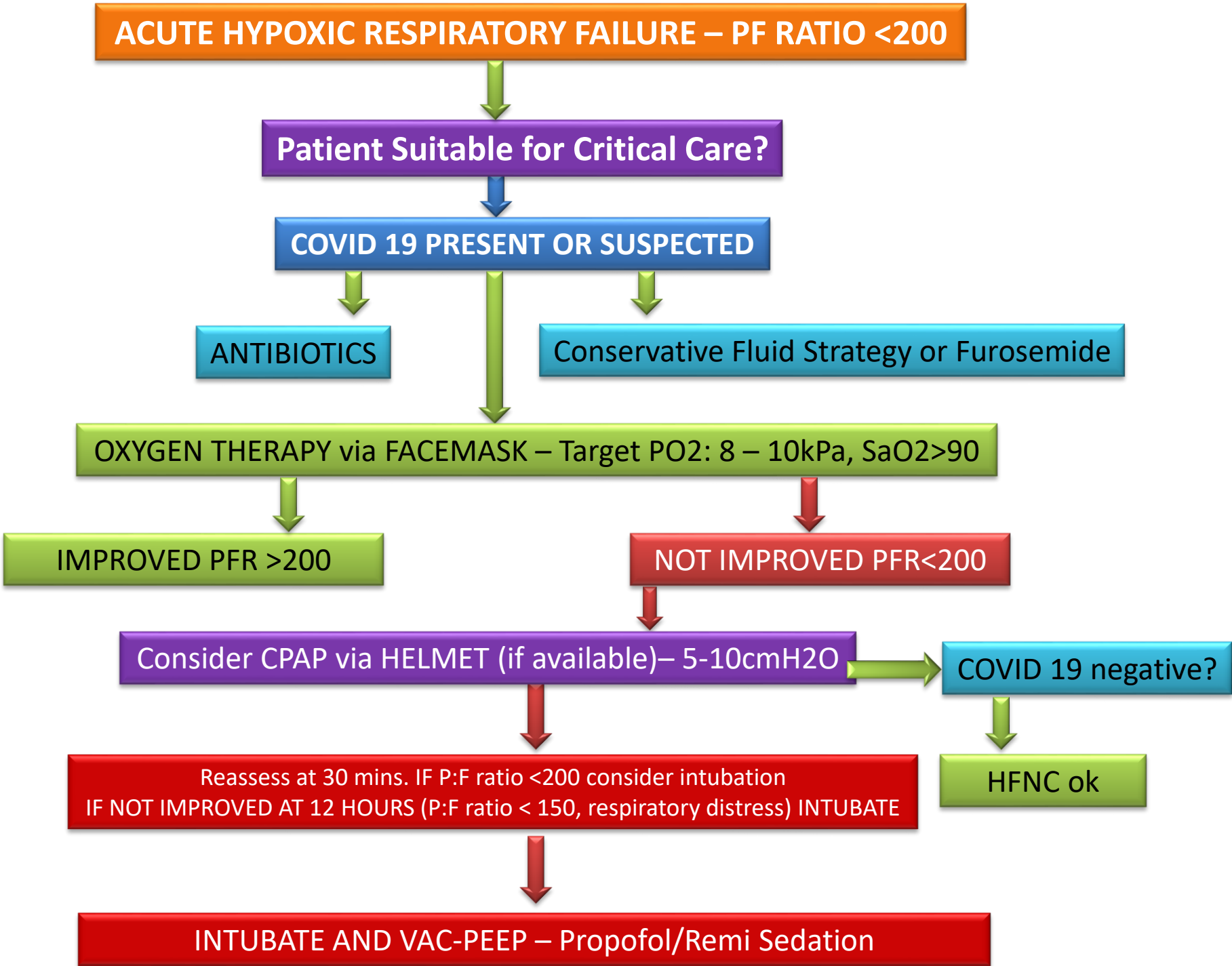
# Main priorities for critical care teams

- Be prepared
- Triage appropriately
- Prevent HCW and nosocomial infection
- Intubate early
- Conservative fluid strategy for shock
- Supportive care is the mainstay of treatment
- Typically require long periods of IPPV (7-10 days)

# Suggested ARDS Mechanical Ventilation Protocol

For Confirmed or Suspected COVID-19

March 2020


ACUTE HYPOXIC RESPIRATORY FAILURE – PF RATIO <200
Patient Suitable for Critical Care?
COVID 19 PRESENT OR SUSPECTED
ANTIBIOTICS
Conservative Fluid Strategy or Furosemide
OXYGEN THERAPY via FACEMASK – Target PO2: 8 – 10kPa, SaO2>90
IMPROVED PFR >200
NOT IMPROVED PFR<200
Consider CPAP via HELMET (if available)– 5-10cmH2O
COVID 19 negative?
HFNC ok
Reassess at 30 mins. IF P:F ratio <200 consider intubation
IF NOT IMPROVED AT 12 HOURS (P:F ratio < 150, respiratory distress) INTUBATE
INTUBATE AND VAC-PEEP – Propofol/Remi Sedation

# Acute Hypoxic Respiratory Failure due to COVID19 $PaO_2/FiO_2$<200

Intubate – VAC Ventilation
TV 350ml Female (adjust)
TV 425ml Male (adjust)
Sedate to RASS -4
Limited use of RM*
PEEP = 10cm$H_2O$

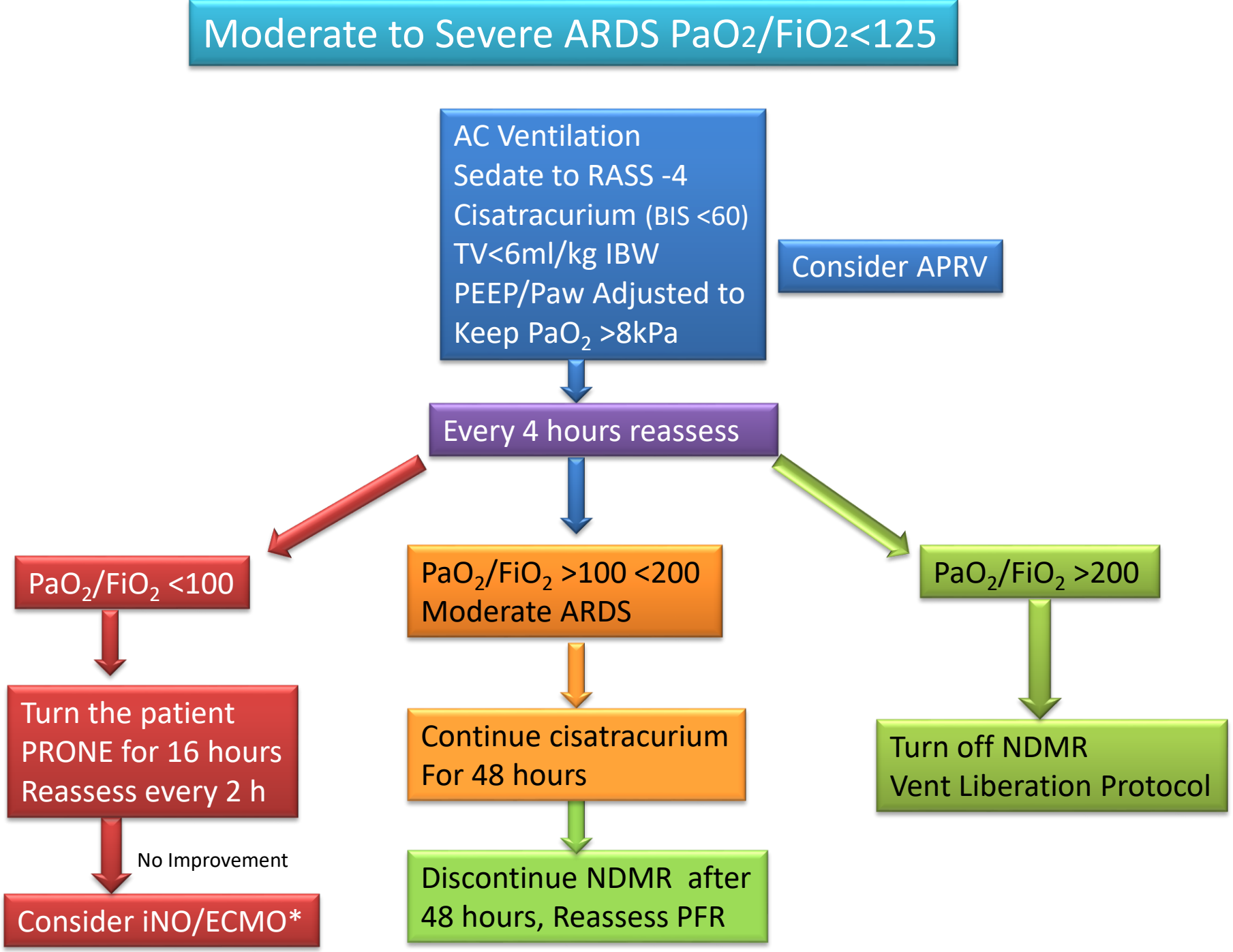
After 2 hours reassess

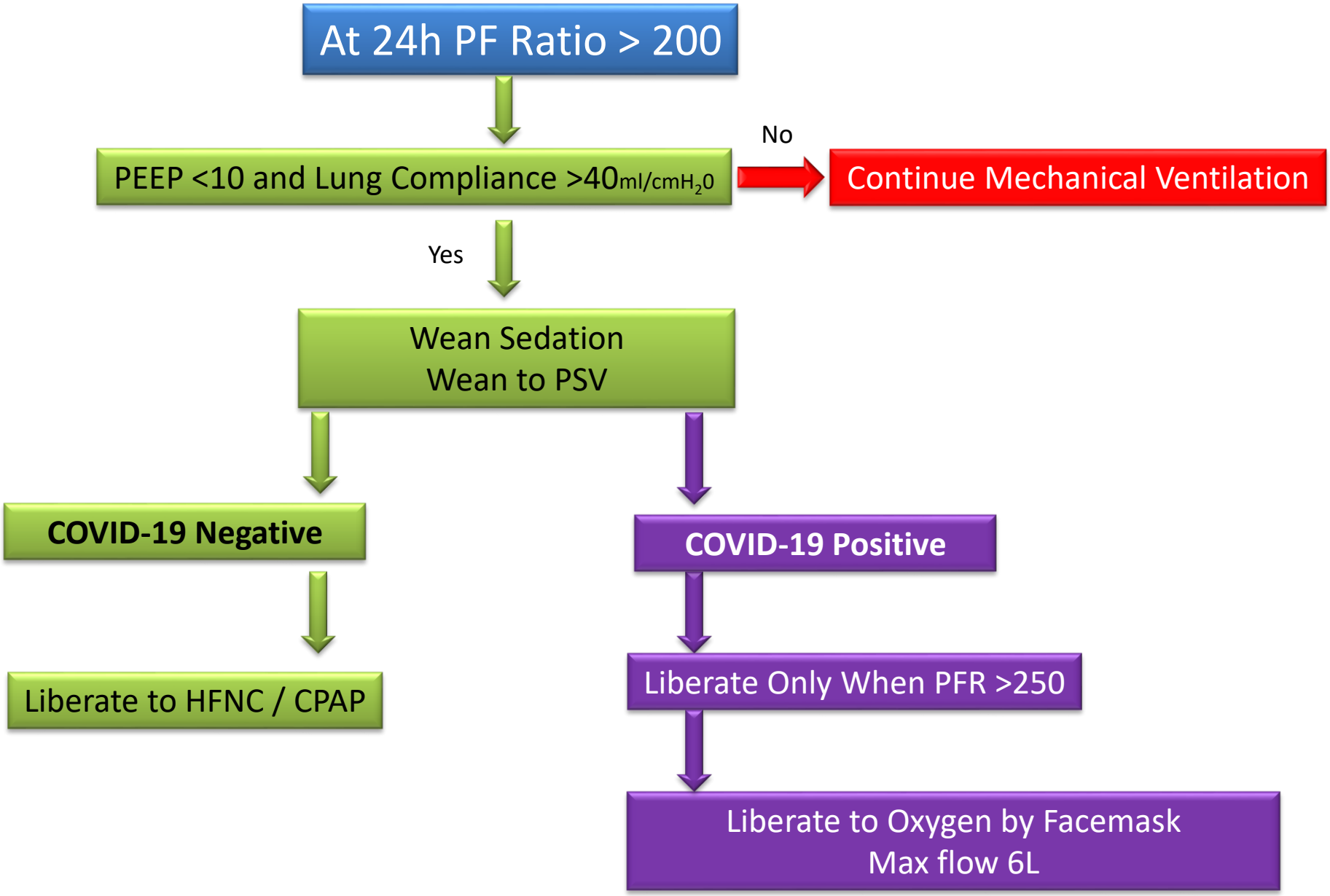
$PaO_2/FiO_2$ <125
Bilateral Infiltrates CXR
Moderate-Severe ARDS

Continue sedation RASS-4
Administer Cis-Atracurium

$PaO_2/FiO_2$ >125
Bilateral Infiltrates CXR
Moderate ARDS

Sedate to RASS -2
Continue Vent Strategy


Moderate to Severe ARDS PaO2/FiO2<125
AC Ventilation
Sedate to RASS -4
Cisatracurium (BIS <60)
TV<6ml/kg IBW
PEEP/Paw Adjusted to
Keep PaO2 >8kPa
Consider APRV
Every 4 hours reassess
PaO2/FiO2 <100
PaO2/FiO2 >100 <200
Moderate ARDS
PaO2/FiO2 >200
Turn the patient
PRONE for 16 hours
Reassess every 2 h
Continue cisatracurium
For 48 hours
Turn off NDMR
Vent Liberation Protocol
No Improvement
Consider iNO/ECMO*
Discontinue NDMR after
48 hours, Reassess PFR




Ventilator Liberation Protocol

# ARDSnet PEEP Protocol

**OXYGENATION GOAL: $PaO_2$ 55-80 mmHg or $SpO_2$ 88-95%**
Use a minimum PEEP of 5 cm $H_2O$. Consider use of incremental $FiO_2$/PEEP combinations such as shown below (not required) to achieve goal.

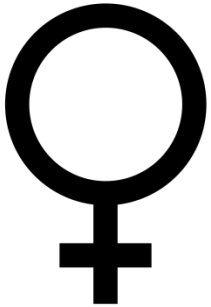
| $FiO_2$ | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 |
|---|---|---|---|---|---|---|---|---|
| **PEEP** | 5 | 5 | 8 | 8 | 10 | 10 | 10 | 12 |

| $FiO_2$ | 0.7 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 |
|---|---|---|---|---|---|---|
| **PEEP** | 14 | 14 | 14 | 16 | 18 | 18-24 |

**MAXIMAL ALLOWABLE TIDAL VOLUMES BASED ON PREDICTED BODY WEIGHT (PBW)**

350ml

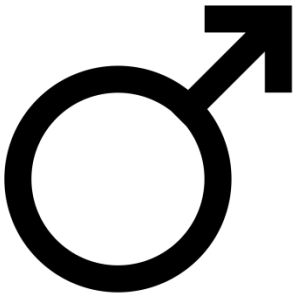
| FEMALE | | |
|---|---|---|
| HEIGHT feet | HEIGHT cm | TV 6ml/kg |
| 5' 0 | 152.4 | 275 |
| 5' 1 | 155 | 290 |
| 5' 2 | 158 | 300 |
| 5' 3 | 160 | 315 |
| 5' 4 | 163 | 330 |
| 5' 5 | 165 | 340 |
| 5' 6 | 168 | 360 |
| 5' 7 | 170 | 370 |
| 5' 8 | 173 | 385 |
| 5' 9 | 175 | 400 |
| 5' 10 | 178 | 410 |
| 5' 11 | 181 | 425 |
| 6' 0 | 183 | 440 |
| 6' 1 | 186 | 450 |
| 6' 2 | 188 | 465 |
| 6' 3 | 191 | 480 |
| 6' 4 | 193 | 495 |



**MAXIMAL ALLOWABLE TIDAL VOLUMES BASED ON PREDICTED BODY WEIGHT (PBW)**

| MALE | | |
|---|---|---|
| HEIGHT feet | HEIGHT cm | TV 6ml/kg |
| 5' 0 | 152.4 | 300 |
| 5' 1 | 155 | 315 |
| 5' 2 | 158 | 330 |
| 5' 3 | 160 | 340 |
| 5' 4 | 163 | 355 |
| 5' 5 | 165 | 370 |
| 5' 6 | 168 | 385 |
| 5' 7 | 170 | 400 |
| 5' 8 | 173 | 410 |
| **5' 9** | **175** | **425** |
| 5' 10 | 178 | 440 |
| 5' 11 | 181 | 450 |
| 6' 0 | 183 | 465 |
| 6' 1 | 186 | 480 |
| 6' 2 | 188 | 495 |
| 6' 3 | 191 | 505 |
| 6' 4 | 193 | 520 |

425ml



# Useful Resources:

https://www.intensivecare.ie/wp-content/uploads/2020/02/ICS-Guidelines-COVID-19-V2-1.pdf

https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected

https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/algorithms/

https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/

https://www.nejm.org/coronavirus?cid=DM88295&bid=163494080