Sultanate of Oman
Capital Market Authority
EXECUTIVE PRESIDENT'S OFFICE

سلطنة عمان
الهيئة العامة لسوق المال
مكتب الرئيس التنفيذي

Classification: Restricted
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Date: 8 Shawal, 1441H
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التاريخ: ٨ شوال ١٤٤١ هـ
الموافق: ٣١ مايو ٢٠٢٠م

Messrs. Chief Executive Officers/General Managers
Insurance Companies, Brokers and Agents
for Insurance

الأفاضل/ الرؤساء التنفيذيين ومديري العموم
شركات وسماسرة ووكلاء التأمين المحترمين

After Compliments,

تحية طيبة وبعد ،

Subject: Provision of medical tests and Treatment for insured infected with Coronavirus (COVID-19)

الموضوع: تقديم الفحوصات الطبية والعلاج للمؤمن عليهم المصابين بفيروس كورونا (كوفيد-١٩).

Within the framework of efforts from public and private sector organizations to deal with the outbreak of the coronavirus (COVID-19) and the cooperation of everyone in this regard, given the importance of the role played by insurers in providing the required support for the community and the economy during the pandemic.

في إطار الجهود المبذولة من مؤسسات القطاع العام والخاص في السلطنة للتصدي لجائحة كورونا (كوفيد-١٩)، وتعاون الجميع في هذا الخصوص ونظرا لأهمية الدور الذي تقوم به شركات التأمين في أداء واجبها نحو تقديم الدعم اللازم للمجتمع والاقتصاد في ظل انتشار الجائحة.

Based on the coordination between the CMA and the Supreme Committee tasked with dealing with the outbreak, and CMA's coordination with the Omani Insurance Association on the coverage of medical tests and treatment of insured infected with coronavirus (COVID-19).

وبناء على التنسيق الذي تم بين الهيئة العامة لسوق المال، واللجنة العليا المكلفة ببحث آلية التعامل مع التطورات الناتجة عن انتشار فيروس كورونا، وإلى تنسيق الهيئة مع الجمعية العمانية للتأمين حول مبادرة الشركات بتغطية الفحوصات الطبية والعلاج للمؤمن عليهم المصابين بفيروس كورونا (كوفيد-١٩).

All insurance companies are kindly requested to comply with the following instructions:

عليه يرجى من جميع شركات التأمين الالتزام بالتعليمات التالية:

ص.ب : ٣٣٥٩ روي، الرمز البريدي : ١١٢، سلطنة عمان، هاتف: ٢٤٨١٢٧٢٢ - فاكس: ٢٤٨١٦٢٦٦
P.O. Box : 3359 Ruwi, Postal Code : 112, Sultanate Of Oman, Tel.: 24812722 - Fax: 24816266

1. Coverage of the costs of medical tests and treatment of insured infected with coronavirus (COVID-19) up to the annual benefit limits of their respective policies, when they receive treatment in any hospitals.

1. تغطية تكاليف الفحوصات الطبية والعلاج للمؤمن عليهم المصابين بفيروس كورونا (كوفيد-١٩) وفقاً لحدود التغطيات التأمينية المتاحة في وثائقهم، وذلك عند تلقيهم العلاج في أي من المستشفيات.

2. Adoption of price list and treatment guidelines approved by the Ministry of Health (attached) for the coverage of the costs of medical tests and treatment of insured who have coronavirus (COVID-19) when they receive treatment in any hospitals.

2. الاعتماد على قائمة الأسعار ودليل إجراءات العلاج المعتمدين من قبل وزارة الصحة (مرفق)، في تغطية تكاليف الفحوصات الطبية والعلاج للمؤمن عليهم المصابين بفيروس كورونا (كوفيد-١٩)، عند تلقيهم العلاج في أي من المستشفيات.

3. Insurance companies shall bear the costs of medical tests and treatment of insured who are currently receiving treatment in any hospitals, effective from the date of the issuance of this circular.

3. تتحمل شركات التأمين تغطية تكاليف الفحوصات الطبية والعلاج للمؤمن عليهم، الذين ما زالوا يتلقون العلاج في أي من المستشفيات، ابتداءً من تاريخ صدور هذا التعميم.

4. Insurance companies shall bear the costs of medical services for all insured who show symptoms of coronavirus (COVID-19) when receiving treatment in any hospitals.

4. تتحمل شركات التأمين تغطية تكاليف الفحوصات الطبية للمؤمن عليهم الذين تظهر عليهم أعراض فيروس كورونا (كوفيد-١٩)، عند تلقيهم العلاج في أي من المستشفيات.

Insurance companies are requested to provide CMA with a monthly report on:

كما يرجى من شركات التأمين تزويد الهيئة بتقرير شهري وذلك عن:

a. All covered treatment for coronavirus (COVID-19).

b. Loss ratios for total medical insurance portfolio.

أ. جميع الحالات المصابة بفيروس كورونا (كوفيد -١٩) التي تم تغطية علاجها.

ب. الخسارة الكلية لمحفظة التأمين الصحي.

via email med.insurance@cma.gov.om

على البريد الإلكتروني: med.insurance@cma.gov.om

The CMA with the concerned entities will follow up the update of the pandemic and review the results of this circular, in every three months from the effective date.

ستعمل الهيئة وبالتنسيق مع الجهات ذات العلاقة على متابعة تطورات الجائحة ومراجعة نتائج هذا التعميم، وذلك كل ثلاثة أشهر من تاريخ إصداره.

Your support in dealing with the pandemic would be appreciated.

مثمنين ومقدرين جهود شركات التأمين ومبادرتها للقيام بواجبها نحو المساهمة في التصدي لهذه الجائحة.

Best Regards,

Abdullah Salim Abdullah Al Salmi
Executive President

وتفضلوا بقبول فائق الاحترام والتقدير،

عبد الله بن سالم بن عبد الله السالمي
الرئيس التنفيذي

Sultanate of Oman
Ministry of Health
Directorate General of Private Health Establishments

سلطنة عمان
وزارة الصحة
المديرية العامة للمؤسسات الصحية الخاصة

الرقم: و. ص /ه.ع.ه.ص.خ/ 2020/3421م
Ref. : .....

التاريخ: 04/ شوال / 1441 هـ
Date : .....

الموافق: 27 / مايو / 2020 م

المحترم

الفاضل/ أحمد بن علي بن سيف المعمري
نائب الرئيس لقطاع التأمين
الهيئة العامة لسوق المال

تحية طيبة وبعد ،،،

الموضوع / القائمة النهائية للأسعار الموحدة لتكلفة فحص و علاج مرضى كورونا كوفيد -19 لشركات التأمين

بالإشارة إلى الموضوع أعلاه ، وبناء على الإجتماع الذي دار بيننا يوم الخميس الموافق 07/ مايو /2020 م ، عليه نرفق لكم بالطي القائمة النهائية بالأسعار الموحدة لتكلفة فحص وعلاج مرضى كورونا كوفيد -19 بالمستشفيات الحكومية و الخاصة على أن يغطي التأمين كل المؤمنين (عماني و غير عماني) في جميع المؤسسات الصحية (حكومية ، خاصة) ، هذا للإطلاع والعلم وإتخاذ ما يلزم .

وتفضلوا بقبول فائق الإحترام والتقدير

الدكتور/ مازن بن جواد الخابوري
مدير عام المديرية العامة للمؤسسات الصحية الخاصة

نسخة إلى :
- معالي الوزير الموقر
- الملف

P.O. Box : 393 Muscat, Postal Code: 100
Tel. : 24946374, Fax : 24946375
E-mail : dg-phe@moh-gov.om

ص.ب : ٣٩٣ مسقط ، الرمز البريدي : ١٠٠
هاتف : ٢٤٩٤٦٣٧٤ ، فاكس : ٢٤٩٤٦٣٧٥
البريد الإلكتروني :

Sub : Cost Estimation of the Management of COVID-19 Patients

- This cost estimation is based on calculating the cost of health services a COVID-19 patient will need according to the "National Guideline for Clinical Management Pathways for Hospitalized Patients with COVID-19" and the recent
- experience of Al-Nahda and Royal hospitals in managing such patients.
- The cost of the different health services are mainly based on the recently
- updated list of MOH health services prices (not published yet). Indirect costs are not included in this cost estimation.
- The costs presented in this document should be considered as the minimal cost for each patient in relation to the associated clinical condition.
- The treatment costs is estimated for 5-10 days, but this period can be longer or shorter depends on many factors such as patient's condition, comorbidities,
- how fast the patient responds to treatment, etc.
- Medications cost can be different than the ones used in this document, depends on the manufacturing company and whether the medication is brad or generic.
- The cost is estimated according to the possible clinical conditions a COVID-19 patient may present with, **these include**:
    1. Non-severe pneumonia requiring inpatient care
    2. Severe pneumonia
    3. Severe pneumonia requiring ICU care
    4. Other Critical illness related to COVID-19 infection (e.g. ARDS, sepsis, septic or cardiogenic, shock, multi-organ dysfunction/failure)

P.s. The average cost of PCR for COVID-19 is OMR 30/-

1. Non-severe pneumonia requiring inpatient care[1] (average hospital stay – 5 days)

Test/Procedure/ Treatment	Cost per unit	Frequency	Comments	Estimated Cost (OMR)
Portable X-ray	10	2	At least two X-rays, repeated when necessary	20
ECG	10	6	Baseline ECG then daily to check QT interval as long as azithromycin is used (i.e. for 5 days)	60
SARS-CoV-2 PCR	-	1	Cost of sample collection (if the test is not already done)	13
HIV serology	5	1		5
Blood culture	12	1		12
CBC	4	2	Can be done more frequently according to patient's condition	8
RFT	8	2		16
Glucose	2	1		2
LFT	8	1		8
G6PD	5	1	Done if G6PD status is not already known and patient will be started on chloroquine	5
LDH	5	1		5
D-Dimer	7	1		7
CRP	6	2		12
Bone profile	8	1		8
Magnesium	2	1		2
Private Room/ Isolation Room	25	5	Cost per day for 5 days/ includes consultation and nursing care fees	125
PPEs[2]	15	1	Cost per patient	15
Hydroxychloroquine 400 mg bid 1 day then 200 mg bid for 10 days	0.4	10 days	Cost per day (including discharge medications)	4

[1] 7% discount applicable on total bill (discount is applicable on for all services)
[2] Maximum of 3 units PPE's billable per admission

Azithromycin	4.5	5 days	Cost per day	22.5

500 mg od for 5 days				
Ceftriaxone 2 g IV every 24 hrs.	5.5	5 days	Cost per day Can be replaced with augmentin 1.2 g IV every 8 hours depends on hospital protocol and clinical judgment (Cost: 6 R.O per day)	27.5
Oseltamivir (Tamiflu) 75 mg PO every 12 hrs. for 5 days	3	5 days	Cost per day	15
Any other supportive medications e.g. paracetamol, metoclopramide, omeprazole, loratadine, heparin/clexane	-	5 days	Such patients usually don't require or only require minimal oxygen therapy and IV fluids	20
Total Cost				**412 R.O**

Some patients may need additional tests/services such as:

Test/service	**Cost (OMR)**
Blood gas test	5
Lactate test	5
Sputum culture	7
Ferritin	3
Coagulation profile	12
Oxygen therapy	3 R.O per day
IV fluids	5 R.O per day
Other tests or medications based on pre-existing comorbidities or results of the initial tests.	-

2. Severe pneumonia (average hospital stay – 8 days)[3]

Test/Procedure/ Treatment	Cost per unit	Frequency	Comments	Estimated Cost (OMR)
Portable X-ray	10	4	On alternate days, and when necessary	40
ECG	10	6	Baseline ECG then daily to check QT interval as long as azithromycin is used (i.e. for 5 days)	60
SARS-CoV-2 PCR	-	1	Cost of sample collection (if the test is not already done)	13
HIV serology	5	1		5
Blood culture	12	1		12
Sputum culture	7	1		7
CBC	4	8	Done daily, can be done more frequently according to patient's condition	32
RFT	8	8		64
Glucose	2	1		2
LFT	8	1		8
G6PD	5	1	If G6PD status is not already known and patient will be started on chloroquine	5
LDH	5	1		5
D-Dimer	7	1		7
CRP	6	4	On alternate days	24
Bone profile	8	1		8
Magnesium	2	1		2
Ferritin	3	1		3
Coagulation profile	12	1		12
Blood gas	5	8	Done daily	40
Lactate	5	1		5
Private Room/ Isolation Room	25	8	Cost per day for 5 days/ includes consultation and nursing care fees	200

[3] 7% discount applicable on total bill (discount is applicable on for all services)

PPEs[4]	15	1	Cost per patient	15

[4] Maximum of 3 units PPE's billable per admission

Hydroxychloroquine 400 mg bid 1 day then 200 mg bid for 10 days	0.4	10 days	Cost per day	4
Azithromycin 500 mg od for 5 days	4.5	5 days	Cost per day	22.5
Piperacillin/Tazobactam (Tazocin) 4.5 g IV every 8 hrs.	22.5	7 days	Can be replaced with augmentin 1.2 g IV every 8 hrs. or Ceftriaxone 2 g IV every 24 hrs.	157.5
Oseltamivir (Tamiflu) 75 mg PO every 12 hrs. for 5 days	3	5 days	Cost per day	15
Lopinavir/Ritonavir 400/100 mg bid for 10 days	1.5	10 days	Cost per day	15
Any other supportive medications e.g. paracetamol, metoclopramide, omeprazole, loratadine, heparin/clexane	-	8 days		30
Oxygen therapy	3	8 days	per day	24
IV fluids	3	8 days	per day	24
Total Cost				**861 R.O**

Some patients may need additional tests/medications such as:

- Interferon beta 8 million unit subcutaneous (3 doses).
- Methylprednisolone 1-2 mg/kg/day for 3-5 days
- Tests or medications for pre-existing comorbidities.

3. Severe pneumonia requiring ICU care [5](average ICU stay – 10 days)

This cost estimation is based on the assumption that the patient is admitted directly to the ICU. However, in real situations many patients are being shifted from the general ward/isolation to the ICU because of patient's condition deterioration, which means many baseline investigations had been already done and main medications had been already started.
Also after patient's condition improves, he will not be discharged home directly but will be shifted back to the general ward/isolation room for some days till he recovers completely. Therefore, pre- and post ICU costs have to be taken into consideration.

Test/Procedure/ Treatment	Cost per unit	Frequency	Comments	Estimated Cost (OMR)
ICU bed/care	65	10 days	Cost per day	650
Intubation	50	1		50
Mechanical Ventilation	20	10	Cost per day	200
Central line	150	1		150
Arterial line	25	1		25
Extubation	10	1		10
Catheters/tubes (urine, suction, NGT)	20	1		20
PPEs[6]	15	1	Cost per patient	15
Portable X-ray	10	5	On alternate days, and when necessary	50
ECG	10	10	Daily, and when necessary	100
SARS-CoV-2 PCR	-	1	Cost of sample collection (if the test is not already done)	13
HIV serology	5	1		5
Blood culture	12	1		12
Sputum culture	7	1		7
Urine culture	7	1		7
CBC	4	10	Can be done more frequently according to patient's condition	40
RFT	8	10		80
Glucose	2	3		6
LFT	8	3		24

[5] 7% discount applicable on total bill (discount is applicable on for all services)
[6] Maximum of 3 units PPE's billable per admission

Coagulation profile	12	2		24
G6PD	5	1	If G6PD status is not	5

			already known and patient will be started on chloroquine	
LDH	5	1		5
D-Dimer	7	1		7
Troponin	5	10	Done daily	50
Ferritin	3	1		3
Fibrinogen	3	1		3
Lipid profile	8	1		8
CRP	6	5	Done on alternate days	30
Bone profile	8	1		8
Magnesium	2	1		2
Blood gas	5	30	Done every shift (i.e. 3 times daily)	150
Lactate	5	2		10
Hydroxychloroquine 400 mg bid 1 day then 200 mg bid for 10 days	0.4	10 days	Cost per day	4
Azithromycin 500 mg od for 5 days	4.5	5 days	Cost per day	22.5
Piperacillin/Tazobactam (Tazocin) 4.5 g IV every 8 hrs.	22.5	10 days	Cost per day	225
Oseltamivir (Tamiflu) 75 mg PO every 12 hrs. for 5 days	3	5 days	Cost per day	15
Lopinavir/Ritonavir 400/100 mg bid for 10 days	1.5	10 days	Cost per day	15
Interferon beta 8 million units subcutaneous od	??	7 doses	Given on alternate days for 14 days	??
Any other supportive medications e.g. paracetamol, metoclopramide, omeprazole, loratadine, heparin/clexane, sedative medications	-	10 days		50

IV fluids (conservative)	3	10 days	Cost per day	30
High protein diet/ enteral nutrition	15	10 days	Cost per day	150
Total Cost				**2,281 R.O**

Some patients may need additional tests/medications such as:

- Methylprednisolone 1-2 mg/kg/day for 3-5 days
- Vasopressor or inotropic medications (e.g. dopamine, dobutamine, adrenaline, noradrenaline, etc.)
- Tests or medications for pre-existing comorbidities.

4. Other Critical illness related to COVID-19 infection (e.g. ARDS, sepsis, septic shock, cardiogenic shock, multi-organ failure)

Treatment is similar to the treatment of severe pneumonia in the ICU but patient may need additionally the following investigations/procedures according to patient's condition or disease progression:

Investigation/Procedure	**Cost (OMR)**
PCR for COVID-19	30 R.O
Chest CT scan	57 R.O
Echo (transthoracic)	35 R.O
Dialysis (HD or CRRT)	76 R.O per session
ECMO (extracorporeal membrane oxygenation)	1,600 R.O for the first day 250 R.O per day for subsequent days
Plasma transfusion therapy	14 R.O per session
Tracheostomy	249 R.O
Non-invasive ventilation (only in special circumstances)	15 R.O per day

Special Notes:

1. 7% discount applicable on the total final bill (discount is applicable on for all services)
2. Maximum of 3 units PPE's billable per admission
3. The above packages and pricelist are unified and applicable to all hospitals treating COVID19 patients
4. The additional days over and above the packages shall be calculated based on pro-rated basis from the package value.

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The spectrum of clinical infection with COVID-19 [SARS-CoV-2] varies from an uncomplicated acute respiratory illness to severe and life-threatening pneumonia requiring ICU care – **Annex1**

There is **no approved therapeutics** or specific antiviral therapies for COVID-19. Hence, the care of patients with COVID-19 is largely supportive at present [Refer to investigational therapeutics section below].

Physicians should use this National Clinical Management Pathway as a guide and depend on their clinical and scientific judgment

General Approach to All Patients with Confirmed COVID-19 Infection:

- Isolate the patient with strict adherence to infection control measures at all encounters.
- Admit to a negative pressure room [priority admission] unless the hospital lacks such facility.
- In the event of unavailability of negative pressure room, admit to a single isolation room [neutral pressure] with a separate toilet facility. Positive pressure rooms should be avoided.
- Implement infection control measures (standard, contact and droplet precautions) at **ALL** times and **AIRBORNE** precautions with eye protection when managing ventilated patients with COVID-19 or when performing aerosol generating procedure – refer to **MOH/DGDSC-DIPC/ COVID-19 IPC guidelines**
- Avoid aerosol generating procedures unless deemed essential for patient care. If such procedures are performed, they shall always be done with strict AIRBORNE precautions and with eye protection(shield/goggles)
- Limit number of healthcare workers and others caring for a patient with COVID-19 to the minimum possible
- Keep a log/register of all healthcare workers and others entering the patient room
- Perform portable chest-x-ray (preferably dedicated) whenever indicated to minimize patient movement outside the isolation room
- For hospitalized patients with COVID-19, collect essential laboratory investigations at baseline [Refer to treatment section below]. Minimize repeating blood tests unless

determined to be clinically essential. Refer to **MOH/DGDSC-DIPC/ COVID-19 IPC guidelines**

- Urgent and essential clinical diagnostic tests should **not postponed**/delayed pending the results of SARS-CoV-2 testing, as long as this is consistent with the local risk assessment for that test and appropriate biosafety measures are in place.
- For point of care tests such as blood gas analysis, use standard precautions to provide a barrier between the specimen and personnel during specimen manipulation after local risk assessment (minimum required gloves, surgical mask, and goggles).
- Clinical laboratories should perform their own risk assessments for handling biological specimens from patients with suspected or confirmed COVID-19. Standard laboratory precautions must be followed at all times. For more details - refer to **Safe Handling and Processing of Samples in Laboratories from Patients with Suspected or Confirmed COVID-19 infection**
- For case definitions refer to **MOH/DGDSC-DIPC/ COVID-19 IPC guidelines**

Note: Patients infected with COVID-19 may progress to pneumonia on day 6-7 of illness. Patients with underlying co-morbidity can deteriorate earlier

A. Clinical Management of COVID- 19 Infection in Adults

I. Pneumonia requiring Hospitalization

A. Essential investigations:

- Portable Chest X ray at baseline, repeat portable chest X ray only when necessary.
- SARS-CoV-2 PCR and respiratory viral screen panel
- Blood culture and sputum culture
- CBC, Urea/Electrolytes, creatinine, LFT, G6PD, D- Dimer, CRP, bone profile and magnesium
- Blood gases and lactate when indicated

B. Standard care for pneumonia:

- Empiric initiation of appropriate antimicrobials for community acquired pneumonia as per hospital protocol and clinical judgment.

  The following antimicrobial options are suggested:

  Amoxicillin-clavulanic acid [1.2 grams IV Q 8hrs] and Oseltamivir [75 mg PO Q 12hrs]

  OR

  Ceftriaxone [2 gm IV Q 24 hrs] + Oseltamivir [75 mg PO Q 12hrs] for 5-7 days. Oseltamivir should be discontinued if Influenza PCR is negative

- Further antimicrobial modification and/or de-escalation shall be based on microbiological results

II. Pneumonia requiring Critical Care

A. Essential investigations:

- Portable Chest X ray at baseline, repeat portable chest X ray only when necessary.
- SARS-CoV-2 PCR and respiratory viral screen panel
- HIV serology
- Blood culture and sputum culture

- CBC, Urea/Electrolytes, creatinine, LFT, G6PD, D- Dimer, CRP, bone profile and magnesium
- Blood gases and lactate

B. Standard care for pneumonia:

- Empiric initiation of appropriate antimicrobials for community acquired pneumonia as per hospital protocol and clinical judgment

  The following antimicrobial options are suggested:

  Piperacillin/Tazobactam (Tazocin) [4.5 grams IV Q 8hrs] + Oseltamivir [75 mg PO Q 12hrs] for 6 -10 days
- Further antimicrobial modification and/or de-escalation shall be based on microbiological results

III. Severe pneumonia requiring ICU Care or ARDS or Septic Shock or cardiogenic Shock

A. Oxygen Therapy and Monitoring

- Give supplemental oxygen therapy immediately to patients with SARI and respiratory distress, hypoxemia or shock and target SpO2 ≥ 94%.
- Reach the target of Spo2 ≥ 90% in non-pregnant adults and ≥ 92% in pregnant patients
- Monitor closely patients with COVID-19 for signs of clinical deterioration, such as:
  - **Rapidly progressive respiratory failure**
  - **Increasing CRP**
  - **Increasing lactate**
  - **Septic/cardiogenic shock**
- Use conservative fluid management in patients with SARI once there is no evidence of shock
- Understand the patient's co-morbid condition(s) to tailor the management of critical illness

- Avoid performing aerosol producing procedures
- Avoid CT scan. Use a portable CXR or a dedicated lung ultrasound

B. Acute Respiratory Distress Syndrome (ARDS)

Management of patients with COVID-19 ARDS is similar to the standard ARDS protocol. However, the following is emphasized:

- Recognize severe hypoxemic respiratory failure when a patient with respiratory distress is failing to respond to standard oxygen therapy and prepare to provide advanced ventilatory support

The following recommendations are for all mechanically ventilated patients with ARDS:

- Implement mechanical ventilation using lower tidal volumes (4–6 mL/kg predicted body weight, PBW), inspiratory pressures (plateau pressure) < 25-27 cmH2O and driving pressure < 13 cmH2O
- In adult patients with severe ARDS, use prone ventilation for 12–16 hours per day early
- Use a conservative fluid management strategy for ARDS patients without hypovolemia
- In patients with moderate or severe ARDS, higher PEEP instead of lower PEEP is suggested **- refer to ARDSNET protocol**
- Recruitment maneuvers **(**RMs) are **conditionally** recommended
- In patients with moderate-severe ARDS (PaO2/FiO2 < 150), neuromuscular blockade by continuous infusion **may be considered** in certain situations like ventilator desynchrony despite sedation, tidal volume cannot be reliably achieved; or refractory hypoxemia or hypercapnia
- Avoid disconnecting the patient from the ventilator, which results in loss of PEEP, de-recruitment and atelectasis
- Use in-line catheters (closed-suctioning system) for airway suctioning and clamp endotracheal tube when disconnection is required (e.g. transfer to a transport ventilator)

- Patients who fails O2 supplementation via simple face mask, with or without reservoir, **should goes directly to endotracheal intubation and not to High Flow Nasal Oxygenation or Non-Invasive ventilation (NIV)** as the delay of intubation can increase mortality rates

C. 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
- In resuscitation for septic shock, give 20 ml/kg crystalloid fluid (e.g. normal saline and Ringer's lactate) as rapid bolus in first 15–30 minutes
- After the initial bolus, start vasopressors early preferably norepinephrine to maintain a MAP>65 mmHg.
- Determine the need for additional fluid boluses 20 ml/kg ml. Based on clinical response and improvement of perfusion reach targets such as:
    - Urine output (> 0.5 mL/kg/hr)
    - Improvement of skin mottling, extremity perfusion, capillary refill and heart rate
    - Level of consciousness
    - Lactate
- Norepinephrine is considered first-line treatment in adult patients; vasopressin can be added to achieve the MAP target. Because of the risk of tachyarrhythmia, reserve dopamine for selected patients with low risk of tachyarrhythmia or those with bradycardia
- Lower target MAP, for example MAP ≥ 60 or higher targets like MAP ≥ 75 may be considered in individualized patients

D. Cardiogenic Shock

- Cardiogenic shock due to either direct viral cardiotoxicity and myocarditis or arrhythmias is not uncommon in COVID-19 infection. If signs of poor perfusion and

cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine 0-20 mcg/kg/min.

- Perform transthoracic ECHO to determine early the cause of shock.
- Taper dobutamine dose to:
    - Improvement of lactate
    - Resolution of signs of hypoperfusion
    - Central venous saturation > 70%

Special Consideration in Critically Ill Patients

Intubation:

- Strict adherence to **AIRBORNE** precautions
- Intubation should be done in a negative pressure room if available and time permit
- Intubation should be done by most experienced physician available
- Staff should have had and passed fit test
- Only necessary personal should be present in the room (Intubating physician, nurse and respiratory therapist when applicable)
- Aim to minimize procedures with potential aerosolization such as bag-mask ventilation (BMV) and awake Fibro-optic intubation
- Use Rapid sequence intubation, avoid BMV. If needed for hypoxia then use the lowest tidal volume to ensure chest rise
- Use 5 minutes of pre-oxygenation with 100% Oxygen to avoid the need for BMV
- Place all used equipment's in a double zip lock bag and sent for decontamination and disinfection

Use of Non-Invasive Ventilation:

Non-Invasive ventilation (NIV) should NOT be used as the first line for respiratory failure secondary to highly Suspected or Confirmed COVID-19 case. In extreme circumstances as a temporizing measure it can be initiated with the following considerations:

- NIV to be only instituted in a negative pressure room given the high risk of aerosolization. This apply to high flow oxygen when available
- Ensure mask seal with zero leak on the monitor
- Criteria for the use of NIV in ARDS are:
    a. The patient is awake and cooperative
    b. The patient is hemodynamically stable and no signs of shock
    c. PaO2/FiO2 ratio of > 150
    d. Feasibility of close monitoring e.g. 1:1 nursing, continuous saturation monitoring
    e. Start with the minimal possible setting IPAP and EPAP to ensure tidal volume of 6ml per kg ideal body weight
    f. Keep low threshold for intubation (elective intubation is association with less BMV and risk of aerosolization)

Adjunctive Therapies for COVID-19 – Use of Corticosteroids

- Systemic steroids are not recommended for **routine** treatment of COVID 19 pneumonia as might delay viral shedding. However, it may be considered for severe individualized cases. If considered, then to start methylprednisolone 1-2 mg/kg/day for 3-5 days.

Extra Corporal Life support (VV-ECMO) consideration

- ECMO is a rescue therapy used in case of severe ARDS and refractory hypoxemia. However, therapy should not be considered the standard of care and consideration should be decided based on case by case discussion after consultation with ECMO team members

Therapeutic Consideration in Adults* with COVID-19 [Refer to algorithm: Page 11]

Disclaimer:

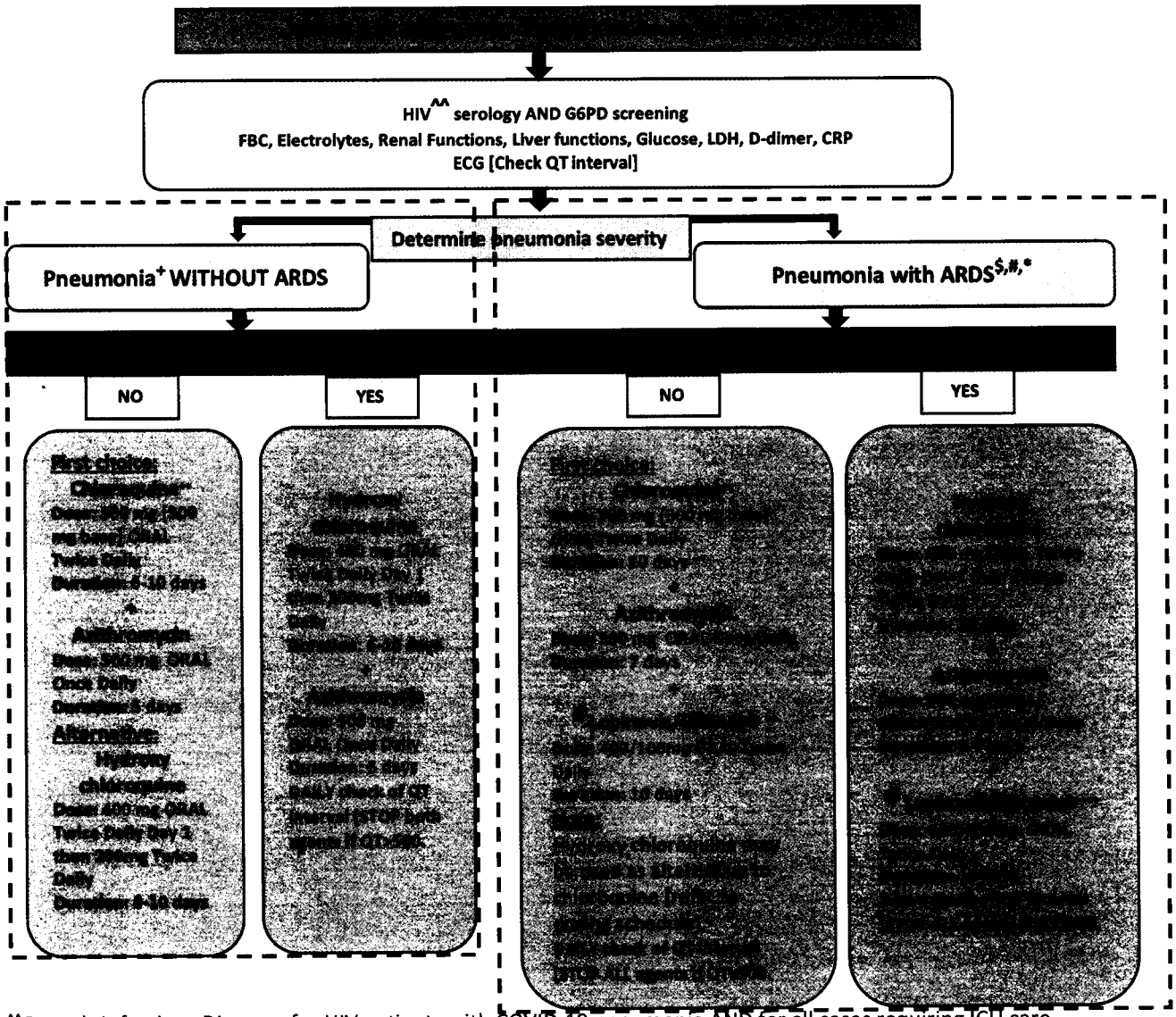
There is no approved specific therapeutics including antivirals for the treatment of COVID-19 associated Pneumonia at the time of writing of this treatment algorithm. Therapeutic agents referred to in this algorithm are currently unproven and their use is based on limited preliminary data, scarce in vitro studies, limited clinical experience from affected areas, and known safety record. The care of patients with COVID-19 is largely supportive at present.

*Excludes PREGNANT women.

Consent:

Obtain a WRITTEN informed consent. A proxy consent should be obtained from a family member or other authorized decision-maker If the patient cannot. The patient should be made aware that the treatment might not benefit him/her and might have potential side effects.

National COVID-19 Drug Treatment Algorithm in ADULTS [excluding pregnant women]



^^Consult Infectious Diseases for HIV patients with COVID-19 pneumonia AND for all cases requiring ICU care.
+Pneumonia PLUS one of the following: respiratory rate > 30 breaths/min or SpO2 ≤ 93% on room air.
++Decrease dose by 50% in patients with eGFR < 10 and in patients on chronic hemodialysis.
+++Equivalent dose SYRUP shall be used instead of tablets for intubated patients. Tablets shall NOT be crushed.
@Lopinavir/Ritonavir has serious drug-drug interaction with Hydroxychloroquine [increase QT interval] and shall be replaced if QTc prolonged by Darunavir [Dose: 600mg PO Twice daily for 10 days]
$**Remdesivir** [if available] may be used instead of Kaletra [Dose: 200 mg IV LOADING, then 100 mg Once daily for 5 days].
#**Tocilizumab** [IL-6 Inhibitor] may be used in selected patients with cytokine storm syndrome and [with increased levels of IL-6] associated with COVID-19 ARDS. Dose: 4 mg/kg in 100 ml NS IV [One dose only].
***Favipiravir** [if available] may be used instead of Kaletra [Dose: 1600 mg PO BID on day 1, followed by 600 mg PO TID from day 2 for 7 days]
**Interferon Beta-1B may be considered in severe cases [Dose 0.25mg (8 million) IU Subcutaneous injection alternate day for 3 doses]
Corticosteroids: Shall NOT be routinely given for treatment of COVID-19 associated pneumonia. When given for other indications, Methylprednisolone 40 mg IV twice daily for 5 days may be used.

B. Clinical Management of COVID-19 Infection in Children

Scope: this guideline applies to infants and children (younger than 13 years of age) confirmed to have COVID-19 by PCR testing.

General considerations for children:

- Data about COVID-19 in children remain scarce. The true rate of infection in children remains unknown, but the symptoms and associated morbidity and mortality appear to be significantly milder than what is observed in adults.
- Out of 44,672 confirmed cases in China, only 416 (1%) were in children < 10 years of age, with no reported fatalities in this age group. Likewise, in Italy, out of 22,512 reported cases, 270 cases (1.2%) were in patients 18 years of age or younger. There were no fatalities reported in this age group.
- In a study of 2,143 pediatric patients with COVID-19 in China, the median age was 7 years (IQR 2-13). There was one fatality in the study. The study stated that children with COVID-19 could develop ARDS, respiratory failure, shock, multi-organ failure, myocardial injury, coagulopathy and encephalopathy. The severity of illness was as follows:
    - 4% asymptomatic
    - 51% mild (usually URTI, sometimes gastroenteritis)
    - 39% pneumonia without hypoxemia
    - 5% severe pneumonia
    - 1% critical
- In the same study, the proportion of severe or critical illness among different pediatric age groups was as follows:
    - < 1 years: 11%
    - 1 – 5 years: 7%
    - 6 – 10 years: 4%
    - 11 – 15 years: 4%
    - 16 – 18 years: 3%

- Symptoms in children vary and can be mild and non-specific. Most symptoms described are respiratory, including cough, fever, tachypnea, and upper respiratory symptoms. Vomiting and diarrhea, as well as conjunctivitis, have been described in some cases as well.
- The majority of cases in children do not require admission to the hospital, and care should be provided under home isolation.
- For well-appearing newborn babies whose mothers are confirmed to have COVID-19, evidence is currently insufficient to make a clear recommendation. The decision on how to manage should be made after discussion between the physician and the family, weighing the risks and benefits of each approach. There are generally two options for management:
    - Baby stays with the mother under isolation, while taking measures to minimize the risk of infection to the baby, including that the mother maintains good hand hygiene, wears a mask, and disinfects the breast pump after every use (if using it). Breastfeeding should be encouraged, either through expressed breast milk or direct breastfeeding with precautions.
    - Baby is isolated from the mother until the mother recovers completely and is no longer considered infectious. In this circumstance, the mother should be encouraged to provide expressed breast milk to the baby. While this approach minimizes the risk of infection to the baby, it may adversely affect mother-infant bonding and the success of breastfeeding.
- Children with primary or secondary immunodeficiencies and children suffering from chronic illness (including chronic lung or heart disease, sickle cell disease) are likely to be at a higher risk for severe infection, and should be cared for with more caution.
- Viral RNA has been detected in the stool samples of infected children. Fecal shedding of the virus can be prolonged (up to several weeks, possibly longer than respiratory shedding). Therefore, fecal material (and diapers) of infected patients should be presumed to be infectious.

Medications with potential anti-viral activity for children with COVID-19

- **Disclaimer:** There are no approved specific therapeutics including antivirals for the treatment of COVID-19 at the time of writing of this guideline. Therapeutic agents referred to in this algorithm are currently unproven and their use is based on limited preliminary data, scarce in vitro studies, limited clinical experience from affected areas, and known safety record. The care of patients with COVID-19 is largely supportive at present. Decision to start these medications should be made after consultation with an infectious diseases specialist.
- **Consent:** Obtain a written informed consent from the child's parents before starting any investigational or unapproved medication. The potential benefits and possible harms from the use of these medications should be explained fully.
- Consideration for starting these medications should occur early, as the potential benefit is likely to be maximized with early administration. More specific indications for when to consider these medications are detailed below under *Management*.

Medication	Dose	Notes
Hydroxychloroquine	10 mg/kg loading dose (maximum 600mg), followed by 5 mg/kg/dose every 12 hours (maximum 300mg/dose) Duration: 5-10 days	• Contraindications: QTc > 500 msec, myasthenia gravis, porphyria, retinal pathology, epilepsy • Check for drug interactions
Azithromycin	10 mg/kg (maximum 500 mg/dose) on day 1, followed by 5 mg/kg (maximum 250 mg/dose) on days 2 to 5 Prefer oral route when possible	• Given in combination with hydroxychloroquine • Obtain baseline ECG • Caution: prolonged QTc
Lopinavir/ritonavir	Weight-based dosing based on lopinavir component: • <15 kg: 13 mg/kg/dose twice daily • 15-45 kg: 11 mg/kg/dose twice daily • > 45 kg: 500 mg twice daily	• Generally not recommended due to emerging evidence for lack of clinical efficacy • Avoid in children under 14 days of age

Definitions of clinical syndromes in children:

I. **Mild illness:** upper respiratory tract or gastrointestinal infection without difficulty in breathing or hypoxia.

II. **Pneumonia:** cough with tachypnea or difficulty in breathing without findings of severe pneumonia. Tachypnea is defined as a respiratory rate (in breaths/min) of:

   i. ≥ 60 in infants < 2 months of age.
   ii. ≥ 50 in infants 2 – 11 months of age.
   iii. ≥ 40 in children 1 – 5 years of age.
   iv. > 30 in patients > 5 years of age.

III. **Severe pneumonia:** cough or difficulty in breathing with at least one of the following:

   i. Central cyanosis or SpO_2 < 90%.
   ii. Severe respiratory distress (grunting or very severe chest indrawing).
   iii. Inability to breastfeed or drink, lethargy or unconsciousness, or convulsions.

IV. **Pediatric Acute Respiratory Distress Syndrome (PARDS):** *Refer to Annex (2) for diagnostic criteria and severity stratification*

V. **Septic shock:** any hypotension (SBP < 5th centile or < 2SD below normal for age) OR 2-3 of followings:

   a. Altered mental state
   b. Tachycardia or bradycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70/min or > 150/min in children)
   c. Prolonged capillary refill(>2sec) or warm vasodilation with bounding pules
   d. Tachypnea
   e. Mottled skin or petechial or purpuric rash
   f. Increased lactate
   g. Oliguria
   h. Hyperthermia or hypothermia

Early clinical indicators for severe and critical illness:

- Increasing Tachypnea
- Lethargy and drowsiness
- Progressive increase in lactate level
- Imaging shows:
  - Infiltrates on both sides or multiple lobes
  - Pleural effusion
  - Rapid progress of lesions in short time
- Infants with:
  - Co-morbidities; Congenital heart disease, Broncho-pulmonary Dysplasia (BPD), respiratory tract abnormalities and severe malnutrition
  - Inherited or acquired immune deficiency

Management:

I. Mild illness:

a. Investigations:
   i. No specific investigations are routinely indicated.

b. Supportive measures:
   i. Bed rest.
   ii. Ensure sufficient nutritional intake.
   iii. Maintain good hydration.
   iv. Symptomatic treatment such as antipyretics for fever (paracetamol is preferred, avoid ibuprofen)

c. Antimicrobials:
   i. Antimicrobials are not routinely recommended.
   ii. Antiviral medications: consider for children who are at risk for severe viral infections (examples include, but not limited to: severe combined immunodeficiency, bone-marrow transplant recipients). This should be

done in coordination with an infectious diseases specialist and only after parental consent.

d. Disposition:
    i. Otherwise healthy children with uncomplicated illness should be provided supportive care at home under isolation.
        - The local directorate general for health services should be notified to coordinate isolation and follow-up.
        - Parents should be given clear instructions about home isolation.
        - Parents should be counseled to look for signs of deterioration (such as worsening fevers, difficulty in breathing, apnea, cyanosis, dehydration).
    ii. Admission and observation may be considered for children at risk for progression to severe disease (examples: severely immunocompromised, chronic heart or lung disease).

II. Pneumonia:

a. Investigations:
    i. CBC, urea/electrolytes, bone profile, magnesium, blood glucose, LFT, LDH, G6PD screen (if not previously known)
    ii. Consider blood culture and CRP if febrile
    iii. Chest x-ray
    iv. ECG
    v. Respiratory viral panel

b. Supportive measures:
    i. Bed rest.
    ii. Ensure sufficient caloric intake.
    iii. Maintain good hydration, avoid over hydration.
    iv. Symptomatic treatment such as antipyretics for fever (paracetamol preferred, avoid ibuprofen)

v. Maintain $SpO_2 > 94\%$

c. Antimicrobials:

i. If secondary bacterial pneumonia is suspected, consider giving oral amoxicillin, 45-90 mg/kg/day in 2-3 divided doses, for 5-7 days.

ii. Antiviral medications: not routinely recommended in otherwise healthy children. Consider starting early in children at increased risk for progression to severe disease (examples: severely immunocompromised, chronic heart disease, < 1 year of age), after consultation with an infectious diseases specialist and obtaining parental consent.

d. Disposition:

i. Observation in the hospital until there is clinical improvement.

III. Severe pneumonia:

a. Investigations:

i. CBC, urea/electrolytes, bone profile, magnesium, blood glucose, LFT, d-dimer, LDH, G6PD screen (if not previously known)

ii. Blood culture and CRP

iii. Chest x-ray

iv. ECG

v. Respiratory viral panel

vi. Blood gas and lactate when indicated

b. Supportive measures:

i. Bed rest

ii. Ensure sufficient caloric intake

iii. Maintain good hydration (for intravenous hydration, use isotonic solutions, do NOT use hypotonic solutions)

iv. Close monitoring of vital signs, signs of respiratory distress and O_2 saturation

v. Provide oxygen therapy via nasal cannula or face mask to maintain O2 saturation > 94%

vi. Intubation and invasive mechanical ventilation: if the patient develops hypoxemia or respiratory distress which cannot be alleviated by oxygen therapy.

vii. We do not recommend routine use of NIV or Humidified High Flow Nasal Cannula Oxygen (HHFNCO) (high risk for aerosolization, increases the risk of infecting healthcare workers).

viii. Steroids: do not routinely give systemic corticosteroids for treatment of COVID-19 pneumonia unless required for other reasons (e.g. refractory septic shock)

c. Antimicrobials:

i. Empiric antibiotic coverage:

- Intravenous ceftriaxone, 50-80 mg/kg/day once daily.
- Consider intravenous piperacillin/tazobactam, 90 mg/kg/dose every 8 hours, for immunocompromised children.

ii. Empiric coverage for influenza until testing results become available: oseltamivir

iii. Antiviral medications: consider starting early after consultation with an infectious diseases specialist and obtaining parental consent.

d. Disposition:

i. Admit for further management

IV. **Management of PARDS:** Treat PARDS according to the 2015 PALICC definition; *please refer to Annex (2).* Consider the followings when treating PARDS:

a. Lung-protective ventilation; Low tidal volumes 3–6 mL/kg if poor compliance, 5–8 mL/kg if preserved compliance.

b. Keep Plateau pressure ≤ 28 cm H2O

c. Periodic prone positioning; Consider prone positioning for 12-16 hours in cases of severe PARDS. This is found to be very effective in adults with COVID-19 pneumonia/ARDS (expert opinion).
d. Fluid management; aim for negative fluid balance once hemodynamicaly stable
e. Sedation and muscle relaxants to achieve effective MV
f. Start high frequency oscillatory ventilation (HFOV) or bi-level ventilation in patients with Plateau >28 cm H2O
g. Other adjunctive Therapies:
    i. Inhaled nitric oxide, surfactants and steroids are not recommended for routine use.
    ii. ECMO can be considered if the above therapeutic measures failed provided the patient does not have multi-organ failure and no co-morbidities. **Decision of ECMO should be taken on a *case-by-case* basis.**

V. **Management of septic shock in children:** follow recent surviving sepsis guidelines. A few important pertinent points are mentioned below:
a. In resuscitation from septic shock in children, give 20 ml/kg as a rapid bolus and up to 40-60 ml/kg in the first 1 hr. Do not use hypotonic crystalloids, starches, or gelatins for resuscitation.
b. Fluid resuscitation may lead to volume overload, including respiratory failure. If there is no response to fluid loading and signs of volume overload appear (for example, crackles on lung auscultation, or hepatomegaly), then reduce or discontinue fluid administration.
c. Administer vasopressors when shock persists during or after fluid resuscitation. Adrenaline or Noradrenaline are preferred first line vasopressors over Dopamine.
d. If central venous catheters are not available, vasopressors can be given through a peripheral IV, but use a large vein and closely monitor for signs of

extravasation and local tissue necrosis. If extravasation occurs, stop infusion. Vasopressors can also be administered through intraosseous needles.

e. If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine or milrinone.

Performing high risk procedures:

If high risk procedures are medically necessary, they should be undertaken in a negative pressure room with PPE precautions:

- Intubation, extubation and related procedures such as manual ventilation and open suctioning
- Tracheostomy procedures (insertion/open suctioning/removal)
- Bronchoscopy
- Non-invasive ventilation (NIV) such as bi-level positive airway pressure (BiPAP) and continuous positive airway pressure ventilation (CPAP)
- High-frequency oscillating ventilation (HFOV)
- High flow nasal oxygen (HFNO), also called high flow nasal cannula
- Induction of sputum

Intubation: *Please refer to **Annex 2** for further elaboration on the recommended way in intubation of patients with COVID-19.*

C. Intra-hospital Transfer of Critically Ill suspected or Confirmed COVID-19 Infected Patients

Movement of the patient should be limited to extreme circumstances, routine radiological investigations and procedures should be guided by clinical judgement to avoid unnecessary transfer. The hospital needs to determine the fasted route with the least contact with others in the hospital

- The need for the transfer needs to be determined by the most senior physician in the team
- The receiving service e.g. radiology CT room, need to be notified and alerted prior to the patient transfer
- The patient should be transferred straight to the receiving service with no waiting in the common areas
- The transferring and the receiving staff should wear PPE's
- No suction or disconnection of the ventilator during transfer. In case a disconnection is needed to change the ventilator, the tube should be clamped prior to disconnection and unclamped after re connecting the ventilator
- If the patient is tracheostomized and not ventilated, the tracheostomy cuff should be inflated and HME filter (Swedish nose) is attached. Suction should be avoided during the transfer

D. Guidelines for De-isolation of Patients with Suspected or Confirmed COVID - 19 Infection:

The currently available evidence from global experience with COVID-19 outbreaks agreed that no single indicator may be effectively used to decide on de-isolation of a suspect and/ or confirmed case. There were three notable operational challenges in the de-isolation of cases;

- With substantial numbers of suspect cases admitted for isolation and the need to hold patients for repeated testing, there was a need to manage isolation room occupancy.
- For patients who needed ongoing inpatient care for other reasons, we also need to address the risk of inadvertent nosocomial amplification, to reduce the risk of transmission from patients who had tested negative early in their clinical illness.
- Management of patient with persistent positive PCR

This rigorous framework was developed to help clinicians and infection control team de-isolate COVID-19 patients safely and limiting the risk of health care transmission.

- **De-isolation**: De-isolation of a patient confirmed or suspected of COVID 19, means to discontinue following transmission-based precaution (Contact and Droplet precautions) while ensuring practice of standard precautions.
    - De-isolation does not necessarily means discharge from the facility rather patient may be de-isolated based on the criteria below and continue to be managed for his clinical condition.
    - Discharging patients should be a clinical decision by treating physician in consultation with infection prevention and control (IPC) team regarding isolation precautions.
    - The criteria below are only for de-isolation considering the diagnosis of suspected or confirmed COVID-19, but patient should be assessed for need of transmission-based precautions for other reasons (e.g.: MDRO, suspected TB, diarrhea, protective isolation for immunocompromised).
    - The de-isolation decision should always be coordinated and discussed with IPC team of the facility.
- For management of increasing number of patients requiring isolation and unavailability of single rooms consider the following:
    - Cohort the confirmed cases in one area but **NOT** suspected cases as this may facilitates transmission.
    - Home isolation for suspect or confirmed cases if no clinical institution care is needed and maintaining access to care in case of clinical worsening- Report such cases to the governorate team of DGHS for follow-up of patients and testing results.

Criteria for De- Isolation of a CONIFERMED COVID -19 Patient:

- **Clinical Improvement ***

AND

- **A Negative PCR (Nasopharyngeal & Throat swab or sputum sample) collected only after at least 7 days after illness onset**

* The criteria for the **clinical improvement** should include **both** parameters:

- The patient is **Afebrile** (temp< 38**°C**) ≥ 48hrs without antipyretics

AND

- **Asymptomatic** (No cough/breathlessness) **OR** days of illness from onset ≥ 7 days

** If repeat PCR is positive but the patient is clinically and radiologically improving, the decision of de-isolation depends on discharge status:

- If the patient is for discharge, advise for home isolation for another 14 days depending on symptoms. A Repeat PCR is only indicated if the patient is a healthcare worker who will need negative sample before joining work.
- If the patient still needs admission, isolation should be continued and PCR should be repeated in 7 days if he/she is still inpatient.

***If the repeat PCR is positive and the patient had worsened clinically and/or radiologically, to continue isolation and consider repeating PCR when improving but not before 7 days from last sample tested.

Criteria for De- Isolation of a SUSPECTED Hospitalized COVID-19 Patient:

- If patient's initial PCR result is Negative and clinically improving then he/she can be de-isolated.
- If patient's initial PCR result is Negative and is clinically and/or radiologically worsening then do not de-isolate and repeat PCR after 24- 48 hours according to clinical status using lower respiratory sample e.g. Sputum/ Endotracheal secretions/ Broncho-alveolar lavage

^ Due to the observation of prolonged viral shedding in faeces in confirmed cases, careful personal hygiene precautions after de-isolation are warranted especially in children.

Note: Recommendations will be reviewed and updated on regular base – Follow MOH IPC Policy

D. Guidelines for Safe Handling and Processing of Samples in Laboratories from Patients with Suspected or Confirmed COVID-19 infection

In line with the national preparedness plan for COVID-19, it is important to ensure that safe handling of specimens from suspected/confirmed cases of COVID-19 are in place and implemented according to the international recommendations.

General Instructions:

- This guidance is based on current knowledge of the virus and other coronaviruses.
- For laboratory staff the potential exposure routes are by inhalation of aerosolized virus or by contact with droplets and contaminated fomites. Exposure to upper and lower respiratory tract specimens in the absence of appropriate biological safety measures represents the greatest risk of transmission of SARS-CoV-2 in a laboratory setting.
- SARS-CoV-2 is mostly found in respiratory samples, however it has been identified in stool, urine, and blood samples and thus may pose infection risk.
- **It is your responsibility to ensure that your Biological Safety Cabinet (BSC) Class II is functioning and maintained regularly. If your BSC is Not regularly maintained, this might pose risk of infection.**
- **Standard laboratory precautions must be followed at all times.**
- **Centrifugation** of specimens with infectious potential should be performed using sealed centrifuge with sample bucket. After centrifuge it is essential to wait for 10-15 minutes before unloading samples. Specimens should be loaded and unloaded form the bucket inside the BSC Class II. Ideally de-capping of tubes should be done inside BSC Class II and removing it out of BSC for automated assays. However, if this is not applicable, use the following PPEs (gloves, goggle/face shield, surgical mask). For loading samples for automated assays, standard precautions should be followed.

Please ensure that the following recommendations are implemented in your laboratory:

1. Samples from suspected/confirmed cases must NOT be transported through pneumatic tube. Samples MUST be transported in a double bag in person and handed directly to the laboratory.
2. Urgent and essential clinical diagnostic tests should **not be postponed** pending the results of SARS-CoV-2 testing, as long as this is consistent with the local risk assessment for that test and appropriate biosafety measures are in place.
3. Clinical laboratories should perform their own risk assessments for handling biological specimens from patients with suspected or confirmed SARS-CoV-2.
4. Any procedure with the potential to generate fine-particulate aerosols (e.g. vortexing) should be performed in a BSC Class II.
5. All technical procedures should be performed in a way that minimizes the generation of aerosols and droplets
6. Laboratory staff should wear personal protective equipment (PPE) appropriate to the biological safety level for the work being conducted and consistent with the risk assessment.
7. Respiratory samples from suspected/confirmed cases should be handled by a trained competent laboratory staff.
8. Clinicians may not have considered COVID-19 infection as a potential diagnosis, prior to sending specimens to the laboratory. Good laboratory practice, including the use of standard precautions, regular training of staff, and the use of standard operating procedures, will help minimize potential risks.
9. The processing of samples (respiratory, blood, urine, stool, tissue, other body fluid samples) should be performed inside the BSC Class II wearing the following PPEs:
    - Lab coat
    - Gown
    - Gloves
10. Use BSC Class II when performing the following activities wearing appropriate PPEs (as listed above) as examples:

- Preparation of specimens for molecular testing (for example respiratory sample for SARS-CoV-2 PCR) prior to sample inactivation.
- Aliquoting and/or diluting specimens.
- Inoculation of bacterial or mycological culture media
- Preparation of chamber for counting the number of cells in body fluids.
- Rapid diagnostic tests for urine/CSF/malaria.
- Preparation and fixing (chemical or heat) of smears for microscopy. Smears should be examined and moved outside the BSC only after chemical or heat fixation.
- Any procedure with the risk of generating aerosols.

11. For any procedure that needs to be performed outside a BSC, eye and face protection (e.g. goggles/face shield, mask) should be used to minimize the risk of exposure to laboratory staff. The type of mask used (surgical or N95 mask) will be based on the risk assessment of the procedure being performed.
12. For point of care tests such as blood gas analysis, use standard precautions to provide a barrier between the specimen and personnel during specimen manipulation after local risk assessment (minimum required gloves, surgical mask, and goggles).
13. Blood culture bottles can be loaded inside the machine by applying standard precautions.
14. Subculture of any positive blood culture bottles should be performed within a BSC Class II wearing the appropriate PPEs (point 9).
15. Samples must be plated using disposable instruments in a BSC Class II. All primary cultures should be sealed and incubated in a CO2 incubator. Reading the primary plates should be performed inside BSC Class II. Subcultures can be handled in the routine laboratory.
16. Manual immunoassays need to be performed inside the safety cabinet if possible. If the assay can't be performed inside the safety cabinet, please consider inactivation of samples after local risk assessment and validation.
17. After use, the work surfaces should be disinfected with 70% alcohol or 0.1% sodium hypochlorite.

Handling of Spillage:

- To follow your local guidelines on handling of spillage in laboratories.

- To notify your safety officer, do risk assessment, and manage accordingly.
- For further advice on follow up or contact tracing or testing, please refer to infection control document.

Waste management

- Work surfaces and equipment should be decontaminated after specimens have been processed.
- Use a disinfectant solution with proven activity against enveloped RNA viruses (0.1% sodium hypochlorite), in accordance with local policies and following the manufacturer's instructions.
- Clinical waste should be disposed of according to local and national policies appropriate to the categorization of the waste.
- Waste from auto- analysers is unlikely to pose a significant risk, due to the low sample volume and dilution steps; therefore, special waste disposal precautions are not recommended for auto-analyser waste.
- All disposable waste (samples, plates, pipettes and PPEs) should be double bagged (using autoclave bags) with a secure lid, and the outer bag should be wiped with hypochlorite and then autoclaved.
- Contaminated sharps should always be collected in puncture-proof containers fitted with covers and treated as infectious waste.
- Waste MUST be transported DIRECTLY to the autoclave room for immediate treatment, thus avoiding storage in the autoclave room.
- After autoclaving, waste is no longer considered to be infectious, and can be disposed of via landfill or municipal incineration.

References:

1. Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus Disease 2019 (COVID-19), CDC. 11 March 2020.
2. Guidance: COVID-19: safe handling and processing for samples in laboratories. Public Health England. 12 March 2020.

Annex 1: **Clinical syndromes associated with COVID - 19 infection**

Uncomplicated illness	Patients with uncomplicated upper respiratory tract viral infection, may have non-specific symptoms such as fever, cough, sore throat, nasal congestion, malaise, headache. The elderly and immunosuppressed may present with atypical symptoms. These patients do not have any signs of dehydration, sepsis or shortness of breath.
Pneumonia	P Adult with pneumonia but no signs of severe pneumonia and no need for supplemental oxygen. Child with non-severe pneumonia who has cough or difficulty breathing + fast breathing: (fast breathing - in breaths/min): <2 months, ≥60; 2-11 months, ≥50; 1-5 years, ≥40 and no signs of severe pneumonia
Severe pneumonia	Adolescent or adult: fever or suspected respiratory infection, plus one of the following; respiratory rate >30 breaths/min, severe respiratory distress, SpO2 <90% on room air Child with cough or difficulty in breathing, plus at least one of the following: central cyanosis or SpO2 <90%; severe respiratory distress (e.g. grunting, chest in-drawing); signs of pneumonia with any of the following danger signs: inability to breastfeed or drink, lethargy or unconsciousness, or convulsions. Other signs of pneumonia may be present: chest indrawing, fast breathing (in breaths/min): <2 months ≥60; 2–11 months ≥50; 1–5 years ≥40. The diagnosis is clinical; chest imaging can exclude complications.
Acute Respiratory Distress Syndrome	**Onset**: new or worsening respiratory symptoms within one week of known clinical insult. **Chest imaging (radiograph, CT scan, or lung ultrasound)**: bilateral opacities, not fully explained by effusions, lobar or lung collapse, or nodules. **Origin of oedema**: respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (e.g. echocardiography) to exclude hydrostatic cause of oedema if no risk factor present. **Oxygenation (adults)**: • Mild ARDS: 200 mmHg < PaO2/FiO2 ≤ 300 mmHg (with PEEP or CPAP ≥5 cm H2O, or non-ventilated) • Moderate ARDS: 100 mmHg < PaO2/FiO2 ≤200 mmHg with PEEP ≥5 cm H2O, or non-ventilated) • Severe ARDS: PaO2/FiO2 ≤ 100 mmHg with PEEP ≥5 cm H2O, or non-ventilated) • When PaO2 is not available, SpO2/FiO2 ≤315 suggests ARDS (including in non-ventilated patients) Oxygenation (children; note OI = Oxygenation Index and OSI = Oxygenation Index using SpO2)

	• Bilevel NIV or CPAP ≥5 cm H2O via full face mask: $PaO_2/FiO_2 \leq 300$ mmHg or $SpO_2/FiO_2 \leq 264$ • Mild ARDS (invasively ventilated): 4≤ OI<8 or 5≤ OSI <7.5 • Moderate ARDS (invasively ventilated): 8≤ OI<16 or 7.5≤ OSI<12.3 • Severe ARDS (invasively ventilated): OI≥ 16 or OSI≥ 12.3
Sepsis	**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
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; bradycardia or tachycardia (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

Annex 2: ARD and Intubation in Pediatrics Patients

1. PARDS definition criteria and Severity stratification:

- Acute onset within 7 days of clinical insult
- Chest imaging (CXR or CT): new infiltrates (unilateral or bilateral) consistent with acute parenchymal disease
- Edema not fully explained by fluid overload or cardiac failure
- May present as new acute lung disease in setting of chronic lung disease and/or heart disease

Severity stratification:

I. Mild ARDS (invasively ventilated): $4 \leq OI < 8$ or $5 \leq OSI < 7.5$

II. Moderate ARDS (invasively ventilated): $8 \leq OI < 16$ or $7.5 \leq OSI < 12.3$

III. Severe ARDS (invasively ventilated): $OI \geq 16$ or $OSI \geq 12.3$

Note:

- OI = Oxygenation Index and OSI = Oxygenation Saturation Index using SpO2.
- Use PaO2-based metric when available. If PaO2 not available, wean FiO2 to maintain SpO2 ≤ 97% to calculate OSI or SpO2/FiO2 ratio
- Bi-level (NIV or CPAP) ≥ 5 cmH2O via full face mask: PaO2/FiO2 ≤ 300 mmHg or SpO2/FiO2 ≤ 264

2. Intubation

- Remember that your personal protection is the priority.
- All team involved must be mask fit tested and experienced in donning(wearing) and doffing(removing) of PPE.
- Please review the material and use droplet/ contact isolation precautions (PPE – mask-surgical gown and gloves with eye protection if required) when interacting with patients
- Plan ahead: make sure you have practice donning and doffing
- Pay close attention to avoid self-contamination

- Intubation checklist / senior personnel / allocate roles
- Negative pressure room if possible
- Identify these patients early as we want to avoid NIV
- Lines of communication should be easily available to the team inside the room and the team outside
- Don PPE
- Most experienced intubator available to perform intubation if possible
- Standard monitoring, IV access, instruments, drugs , ventilator and suction checked
- Consider airway adjuncts/ glidescope
- Plan for RSI with skilled assistant to perform cricoid pressure. RSI can be modified
- If plan for manual ventilation use small tidal volumes
- Pre-oxygenate for 5 minutes with 100% O2 to avoid manual ventilation
- Ensure filter between face mask and bag
- Intubate and confirm - avoid stethoscope - EtCO2 and examination of the chest. If using video laryngoscope– use disposable blade Encase rest of the unit in a clear plastic cover Keep other associated equipment outside the room until needed
- Start MV – use filter, inline suction, try not to disconnect from ventilator
- After leaving negative pressure area spillage team to wipe down the surfaces and non-disposable items with hyper chlorite wipes Disposable equipment should be placed in disposable double zip-locked clear plastic bag at end of procedure and disposed of in the burn bins inside the isolation room. All drugs must be discarded
- Proper Doffing PPE

COVID Informed Consent for Treatment with OFF-LABEL Medications

This is a consent form. Its purpose is to inform you about harms and benefits when using an OFF-LABEL drug in the management plan of your condition (COVID 2019 Infection)

Treatment regimen:

Lopinavir-Ritonavir

Chloroquine

Hydroxychloroquine

Interferon alfacon-1

Tocilizumab

Treatment duration:

6-10 days

I _____, understand that medication listed above are all FDA approved for other medical indications with proven safety and efficacy, and they are not approved yet for the treatment of my acute infectious illness (COVID 2019 Infection).

In view of the current lack of other safe and effective alternatives, I give my consent for being treated with one or a combination of above drugs by my treating team.

I acknowledge that drug-related side effects have been explained to me (drug allergy, skin rash, mild anemia, loose motions, interaction with other medications, heart arrhythmia)

Hospital name:

Physician name: **staff number:** **signature:**

Witness name: **staff number:** **signature:**

Patient's name (next of kin): **signature:**

Date:

Time:

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