WHO COVID-19 Case Management Webinar Series: Optimising Care for Patients with Severe COVID-19

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National Clinical Lead COVID oximetry, virtual wards
NHS England & NHS Improvement

Clinical Director Digital innovation
Wessex Academic Health Science Network
COVID-19 The battle for lives will be won at home

It will be educated, empowered patients and aligned triage systems & clear community clinical guidelines that will save more lives than ventilators

WHY?

Early presentations

Silent hypoxia

“a characteristic of this virus that causes oxygen saturation levels of some sufferers to fall to dangerously low levels without them suffering conspicuous difficulties when breathing”

Usually well man with a PMH of hypertension/asthma

- 14.4 first symptoms -> isolation, partner worked in care home
- 21.4-24.4 3 X NHS calls - cough, joint pains but not breathless
- 24.4 partner was admitted with hypoxia via ambulance
- 28.4 He died
WHO Interagency Integrated Triage Tool ≥ 12 years

1. CHECK FOR RED CRITERIA
   - Unresponsive
   - AIRWAY & BREATHING
     - Stridor
     - Respiratory distress* or central cyanosis
   - CIRCULATION
     - Capillary refill ≥ 3 sec
     - Weak and fast pulse
     - Heavy bleeding
     - HR <60 or >150
   - DISABILITY
     - Active convulsions
     - Any two of:
       - Altered mental status
       - Stiff neck
       - Hypoglycaemia
   - OTHER
     - High-risk trauma*
     - Poisoning/ingestion or dangerous chemical exposure*
     - Threatened limb*
     - Snake bite
     - Acute chest or abdominal pain (>50 years old)
     - ECG with acute ischaemia (if done)
     - Violent or aggressive
   - PREGNANT WITH ANY OF:
     - Heavy bleeding
     - Severe abdominal pain
     - Seizures or altered mental status
     - Severe headache
     - Visual changes
     - SBP ≥ 160 or DBP ≥ 110
     - Active labour
     - Trauma

   MOVE TO HIGH ACUITY RESUSCITATION AREA IMMEDIATELY

2. CHECK FOR YELLOW CRITERIA
   - AIRWAY & BREATHING
     - Any swelling/mass of mouth, throat or neck
     - Wheezing (no red criteria)
   - CIRCULATION
     - Vomits everything or ongoing diarrhoea
     - Unable to feed or drink
     - Severe pallor (no red criteria)
     - Ongoing bleeding (no red criteria)
     - Recent fainting
   - DISABILITY
     - Altered mental status or agitation (no red criteria)
     - Acute general weakness
     - Acute focol neurologic complaint
     - Acute visual disturbance
     - Severe pain (no red criteria)
   - OTHER
     - New rash worsening over hours or peeling (no red criteria)
     - Visible acute limb deformity
     - Open fracture
     - Suspected dislocation
     - Other trauma/burns (no red criteria)
     - Known diagnosis requiring urgent surgical intervention
     - Sexual assault
     - Acute testicular/scrotal pain or priapism
     - Unable to pass urine
     - Exposure requiring time-sensitive prophylaxis (eg. animal bite, needled stick)
     - Pregnancy, referred for complications

   MOVE TO CLINICAL TREATMENT AREA

3. CHECK FOR HIGH-RISK VITAL SIGNS
   - HR <60 or >130
   - RR <10 or >30
   - Temp <36° or >39°
   - SpO2 <92%
   - AVPU other than A

   MOVE TO LOW ACUITY OR WAITING AREA

Will be available in the future update to the SARI toolkit

http://blog.clinicalmonster.com/2021/02/12/triage-systems-in-resource-limited-settings/
ENGLAND

PROTECT & INFORM PATIENTS

EARLY PRESENTATIONS
Resources for patients to self monitor symptoms & O2 saturations
Clear public messaging for patients on what normal COVID recovery looks like, and when/how they should call for help*
Reassurance that patients/relatives will be rapidly assessed & escalated should deterioration occur*

PROTECT the HEALTH SYSTEM

APPROPRIATE HEALTHCARE USAGE
Reduced attendance/admission of low-risk patients (with normal oxygen saturations/symptoms)
Earlier discharge of recovering patients
Minimize inappropriate treatments (e.g. oxygen in normoxia, expensive drugs)

Daily positive COVID tests

56 million population
5.9 million COVID cases
319,279 COVID hospital admissions
72,792 COVID hospital deaths

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5.9 million COVID cases
319,279 COVID hospital admissions
72,792 COVID hospital deaths
What predicts death/admission and can be done by patients in their own homes?

5 day mortality (N= 1,212)

Validation of home oxygen saturations as a marker of clinical deterioration in patients with suspected COVID-19

Composite ICU/mortality (N= 1,212)

Outcomes for symptomatic patients at home
- Linked data from patients recording oxygen levels, age and outcomes.

NHS England COVID Safety netting guidance

617/1080 COVID admissions had Sats 95-100%
WHAT? Aligned national pathways across all settings, for all groups

- Community (GP, domiciliary care, care homes)
- Ambulances
- Prisons, Learning Disabilities, mental health
- Hospitals

### Always consider Non-COVID/other pathologies

#### SEVERE
- \( O_2 \leq 92\% \) or lower
- \( \approx \text{NEWS2} \geq 5 \)
- *Or if O2 sats >4% less than usual
- **URGENT HOSPITAL ASSESSMENT**

#### MODERATE
- \( 93 - 94\% \)
- \( \approx \text{NEWS2} 3-4 \)
- *Or if O2 sats 3-4% less than usual
- **WATCH CAREFULLY, CONSIDER COMMUNITY/HOSPITAL ASSESSMENT**

#### MILD
- \( 95\% \) or higher
- \( \approx \text{NEWS2} 0-2 \)
- *Or if O2 sats are 1-2% less than usual
- **UNLIKELY TO NEED HOSPITAL CARE**

Validation of home oxygen saturations as a marker of clinical deterioration in patients with suspected COVID-19

- Matthew Inada-Kim, Francis P Chmiel, Michael J. Bonifaci, Helen Pocock, John J. M. Black, Charles D. Deakin
## PLAN A: Triage, Assessment & virtual care (if hospitals are not overwhelmed)

### 1. Triage

#### Self-referral

- Age > 50
- Immunocompromised, Comorbidities (Cancer, Diabetes, Renal/liver failure, Obesity, Deprivation)

#### High Risk?

#### ? Severe Symptoms

### 2. Assessment

#### Red – Severe

- Assessment +/– testing

#### Amber – Moderate

- Self-care advice provided

#### Green – Mild

### 3. Outcome

#### Hospital Assessment

- Virtual Ward
- Discharge

### Assessment Severity

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Adults</th>
<th>Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red – Severe</td>
<td>Evidence of shortening or changing colour tips. Pauses in their breathing (apnoea) or has an irregular breathing pattern or starts grunting. Severe difficulty in breathing – too breathless to talk. Becomes pale, mottled and feels abnormally cold to touch. Becomes extremely agitated, confused or very lethargic (difficult to wake). Is under 3 months of age with a temperature of 38°C/100.4°F or above.</td>
<td>Severe difficulty in breathing – breathless whilst resting or too breathless to talk in full sentences. Becomes pale, mottled and feels abnormally cold to touch. Becomes extremely agitated, confused or very lethargic (difficult to wake). Develops a rash that doesn’t fade when you roll a glass over it. Stopped passing urine or are passing urine much less than usual.</td>
<td>Urgent help please phone 999 or attend the nearest Hospital Emergency (A&amp;E) Department within an hour.</td>
</tr>
<tr>
<td>Amber – Moderate</td>
<td>Has laboured/rapid breathing or they are working hard to breathe – drawing in of the muscles below their lower ribs, at their neck or between their ribs (recession). Seems dehydrated (sunken eyes, drowsy or no urine passed for 12 hours).</td>
<td>Feeling breathless or difficulty breathing, especially when standing up or moving. Severe muscle aches or tiredness. Shakes or shivers. If you use a pulse oximeter, your blood oxygen level is 94% or 93% or continues to be lower than your usual reading, where your normal oxygen saturation is below 95% (re-take a reading within an hour first). Sense that something is wrong (general weakness, severe tiredness, loss of appetite, peeing much less than normal, unable to care for yourself – simple tasks like washing and dressing or making food). AMBER Seems to be getting worse or if you are worried.</td>
<td>You need to contact a doctor or nurse today. Please ring your GP surgery or call NHS 111 – dial 111. May need further assessment, review and or monitoring following clinical assessment.</td>
</tr>
<tr>
<td>Green – Mild</td>
<td>If none of the features in the red or amber boxes above are present.</td>
<td>If none of the features in the red or amber boxes above are present.</td>
<td>Self Care.</td>
</tr>
</tbody>
</table>

### Self-referral Criteria

- Age > 50
- Immunocompromised, Comorbidities (Cancer, Diabetes, Renal/liver failure, Obesity, Deprivation)

### Adult Oxygen sats NEWS2 Worry

<table>
<thead>
<tr>
<th></th>
<th>ADULT</th>
<th>PAEDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red – Severe</td>
<td>SEVERE: 92% or lower; Moderate: 93-94%; Mild: 95-100%</td>
<td>SEVERE: 92% or lower</td>
</tr>
<tr>
<td>Amber – Moderate</td>
<td>Moderate: 93-94%</td>
<td>PAEDS Oxygen sats</td>
</tr>
<tr>
<td>Green – Mild</td>
<td>Mild: 95-100%</td>
<td>Worry</td>
</tr>
</tbody>
</table>

### Paediatric Assessment

- oxygen sats
- Worry

- Severe: 92% or lower
- Moderate: 93-94%
- Mild: 95-100%
PLAN B Low Acuity Admission units IF hospitals are overwhelmed

‘non-hospital’

O2 Sats 90% or higher

95-100%
- discharge home
- Safety netting
- Self monitoring

93-94%
- OBSERVE

90-92%

COVID admission centre
- Oxygen concentrators (up to FiO2 28%)
- +/- Dexamethasone
- Anticoagulation

< 90%
- If appropriate
- Hospital with ICU facilities

‘hospital’

Sats < 90%
- YES

https://academic.oup.com/qjmed/article/113/12/854/5899741
MILD COVID

What symptoms are usual?

When NOT to contact health services for help

<table>
<thead>
<tr>
<th>CEBM symptoms severity predictor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sputum 1.3</td>
</tr>
<tr>
<td>Nausea or vomiting 1.0</td>
</tr>
<tr>
<td>Sore throat 0.8</td>
</tr>
</tbody>
</table>

What is normal recovery?
What are non-worrying symptoms?

High Risk ≥ 50, Comorbidities/HCP/SOB/Clin.worry, Clinician worry
Low Risk < 50, No Comorbidities, no Clinician worry

In the majority, full recovery is usual within 4 weeks

Odds ratio of death/admission

Patient instruction and info is critical
SEVERE COVID

TRENDS
- Are you feeling Better/worse?
- Breathing symptoms
- Oxygen saturations

Empower patients to call back if they get worse

Timings of patients who deteriorate
Days 5-7 Silent hypoxia
Days 7-11 Significant breathlessness
Beware of a reduction in $O_2$ sats

Increase frequency of contacts days 4-9

When Should I worry? What symptoms are most dangerous?

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Odds ratio of death/admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREATHLESSNESS</td>
<td>4.3</td>
</tr>
<tr>
<td>Severe MYALGIA</td>
<td>2.0</td>
</tr>
<tr>
<td>CHILL / RIGORS</td>
<td>2.4</td>
</tr>
<tr>
<td>Severe FATIGUE</td>
<td>1.4</td>
</tr>
</tbody>
</table>

When and where to seek medical advice

Contact NHS 111
If you experience any of the following COVID-19 symptoms, you should contact 111 as soon as possible.
- Feeling breathless or difficulty breathing, especially when standing up or moving
- Severe muscle aches or tiredness
- Shakes or shivers
- If you use a pulse oximeter, your blood oxygen level is 94% or 93% or continues to be lower than your usual reading where your normal oxygen saturation is below 95% (re-take a reading within an hour first)
- Sense that something is wrong (general weakness, severe tiredness, loss of appetite, peeing much less than normal, unable to care for yourself – simple tasks like washing and dressing or making food).

Oxygen Saturation Advice

If you continue to record these blood oxygen levels seek help

- 100
- 99
- 98
- 97
- 96
- 95
- 94
- 93
- 92
- 91
- 90 or less

Normal blood oxygen level for most people
If you continue to record blood oxygen levels of 92% or less go to hospital within one hour

You can access 111:
- Online at www.111.nhs.uk
- By phone 111
- Via your GP

You should tell the operator you may have coronavirus.

Attend your nearest A&E within an hour or call 999
A minority of people with COVID-19 will suffer more severe symptoms. You should attend A&E as quickly as possible or call 999 immediately if you experience the following:
- Your blood oxygen levels are 92% or less (retake your reading immediately first)
- You are unable to complete short sentences when at rest due to breathlessness
- Your breathing gets worse suddenly.

OR if you develop these more general signs of serious illness:
- Cough up blood
- Feel cold and sweaty with pale or blotchy skin
- Collapse or faint
- Develop a rash that doesn’t fade when you roll a glass over it
- Become agitated, confused or very drowsy
- Stopped passing urine or are passing urine much less than usual.
Patient reassurance & partnership is key

**Virtual Ward**

Home self monitoring with Telephone service +/− app

Supporting early discharge to maintain hospital capacity

**Patient Pathway**

**Alined**

**Patient at home**

**Deterioration**

<table>
<thead>
<tr>
<th>Blood Oxygen Level</th>
<th>What to do / When to seek help</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-100%</td>
<td>Stay at home and continue to check your blood oxygen level regularly</td>
</tr>
</tbody>
</table>
| 93-94%             | Check your blood oxygen level again and within an hour  
|                    | 1. If it’s still 93 or 94% seek help  
|                    | 2. If concerning symptoms seek help  
|                    | • Shortness of breath  
|                    | • Chills/high fever  
|                    | • Severe aches/tiredness  
|                    | • Collapse/Confusion |
| 92% or below       | Check your blood oxygen level again straight away  
|                    | If it's still 92% or below go to hospital immediately |

**Mild**

- Sats ≥ 95% and < 3% desaturation on exertion*

**Moderate**

- Sats 93-94% with < 3% desaturation on exertion*
- OR ≥ 95% with ≥ 3% desaturation on exertion*

**Severe**

- Sats 92% or less
- OR 93-94% with ≥ 3% desaturation on exertion*

*40 step exertion test, Attach Sats probe, Walk 40 steps whilst monitoring or 1 minute Sit-to-Stand

**Consider Discharge**

- Lower acuity  
- Lower clinical concern
- Home Patient Self monitoring

- Higher acuity  
- Higher clinical concern

**ADMISSION**

- Concerning symptoms**  
- Shortness of breath  
- Chills/chills
- Severe myalgia/fatigue  
- Collapse/Confusion

**Clinician supervised VIRTUAL WARD**

Telephone service +/− app

Supporting early discharge to maintain hospital capacity  
If resources allow

**ADMISSION**

**Clinician supervised VIRTUAL WARD**

Telephone service +/− app

Supporting early discharge to maintain hospital capacity  
If resources allow
Does Earlier Admission through home monitoring improve outcomes?

### COVID Oximetry @home: evaluation of patient outcomes

Michael Boniface¹, Michael Burns¹, Chris Duckworth¹, Franklin Duruiheoma¹, Htwe Armitage², Naomi Ratcliffe³, John Duffy³, Caroline O’Keeffe³, Matt Inada-Kim³

Outcomes for COVID-19 hospital admissions if they had/had not been taught how to self monitor for trends of symptoms & O2 sats (Nov. 2020 to Mar. 2021)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No Home monitoring</th>
<th>Home Self monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Length of stay</td>
<td>13.2 days</td>
<td>6.9 days</td>
</tr>
<tr>
<td>Deaths within 30 days</td>
<td>20.5% (130 / 633)</td>
<td>5.8% (8 / 137)</td>
</tr>
<tr>
<td>ICU</td>
<td>8.2% (52 / 633)</td>
<td>3.6% (5 / 137)</td>
</tr>
<tr>
<td>Readmissions within 30 days</td>
<td>8.7% (55 / 633)</td>
<td>0% (0 / 137)</td>
</tr>
</tbody>
</table>

Home monitored COVID patients that are admitted have **Reduced Mortality, Length Of Stay, Intensive Care Admissions & Readmissions**

47,053 COVID-19 patients, 4384 (9.3%) were remotely monitored, they consulted in the emergency department less frequently ($p = 0.05$), were hospitalized less frequently ($p < 0.01$), had shorter hospital stays ($p < 0.0001$), and had a lower mortality rate in their first hospitalization ($p = 0.03$).
EMPOWERING PATIENTS with knowledge +/- devices for how to spot & escalate deterioration

Protecting patients- Earlier presentation
- Reducing mortality
- Reducing hospital length of stay (& ICU)

Protecting healthcare systems-
- Reducing admissions
- Expediting discharge

Thanks for listening! @mattinadakim