

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

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

Clinical Director Digital innovation
Wessex Academic Health Science Network

WHY?

EARLY presentations

Silent hypoxia

usually well man with a PMH of hypertension/asthma

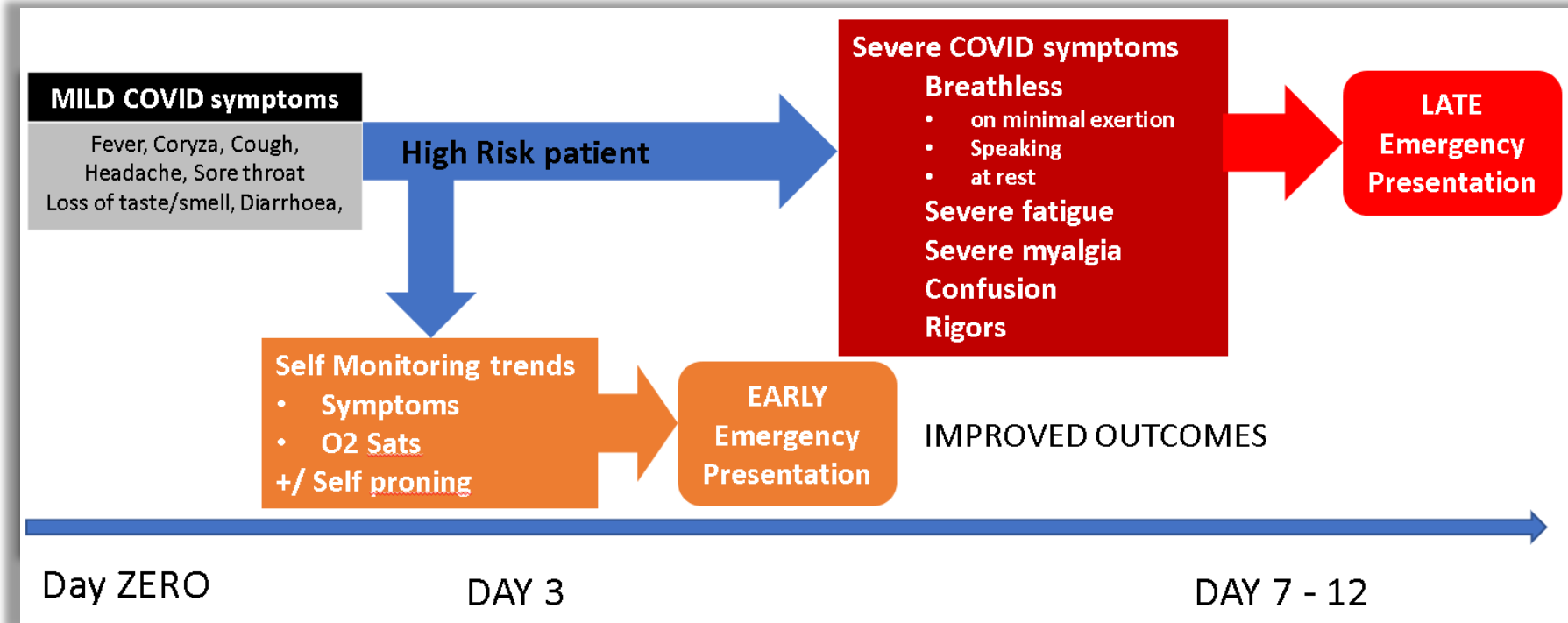
14.4 first symptoms -> isolation, partner worked in care home

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

“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”



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

@mattinadakim

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 <50 or >150

DISABILITY

- Active convulsions
- Any two of:
 - Altered mental status
 - Stiff neck
- Hypothermia or fever
- Headache
- 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

YES

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 focal 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, needlestick)
- Pregnancy, referred for complications

YES

MOVE TO CLINICAL TREATMENT AREA



Patients with high-risk vital signs or clinical concern need up-triage or immediate review by supervising clinician

YES

3

CHECK FOR HIGH-RISK VITAL SIGNS

HR <60 or >130

RR <10 or >30

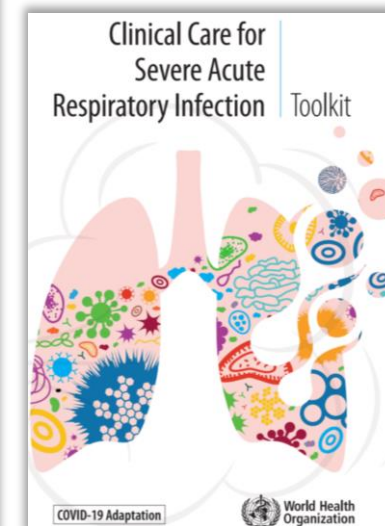
Temp <36° or >39°

SpO2 <92%

AVPU other than A

NO

MOVE TO LOW ACUITY OR WAITING AREA



Will be available in the future update to the SARI toolkit

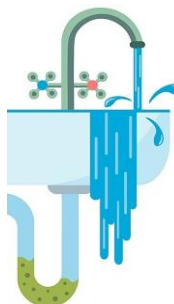


56 million population
5.9 million COVID cases
319,279 COVID hospital admissions
72,792 COVID hospital deaths

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)

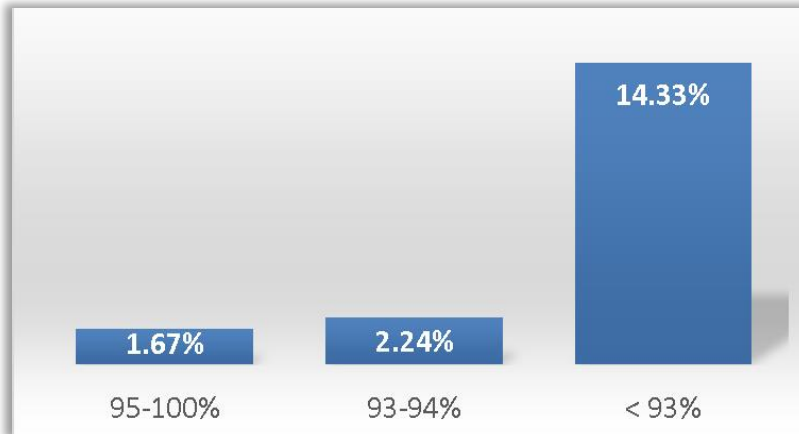
What predicts death/admission and can be done by patients in their own homes?

outcomes for symptomatic patients at home

- Linked data from patients recording oxygen levels, age and outcomes.

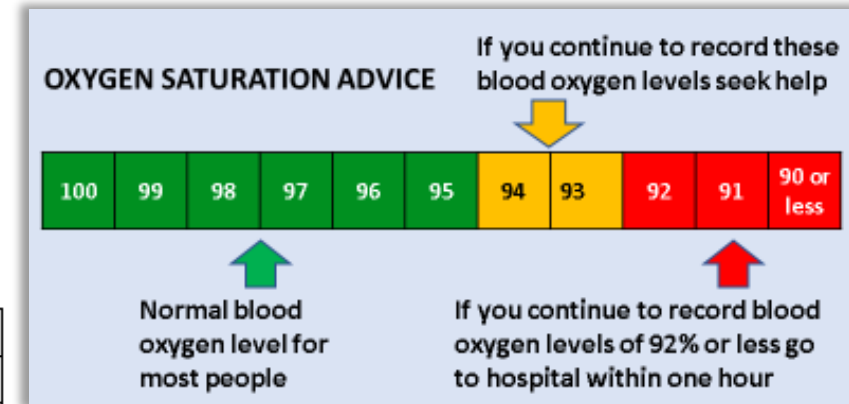


5 day mortality (N= 1,212)

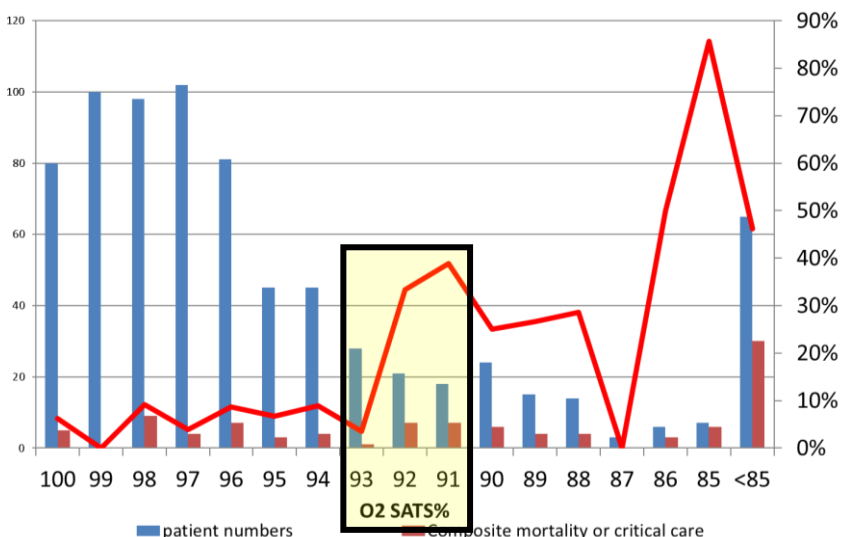


Validation of home oxygen saturations as a marker of clinical deterioration in patients with suspected COVID-19

Variable	AUROC (95 % CI)
Age band	0.690 (0.642-0.737)
Respiration rate*	0.662 (0.599-0.729)
Systolic blood pressure*	0.586 (0.528-0.645)
Heart rate*	0.537 (0.490-0.585)
Temperature*	0.583 (0.530-0.637)
Oxygen Saturation (on air)	0.772 (0.712-0.833)
NEWS2	0.715 (0.670-0.760)
NEWS2 + age	0.771 (0.718-0.824)
Oxygen saturation + age	0.820 (0.785-0.854)



Composite ICU/mortality (N= 1,212)



Leading to National policy change and mandate

[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

O₂ 92%* or lower
≈ NEWS2 ≥ 5

*Or if O2 sats >4% less than usual

URGENT HOSPITAL ASSESSMENT

MODERATE

O₂ 93 - 94%*
≈ NEWS2 3-4

*Or if O2 sats 3-4% less than usual

**WATCH CAREFULLY, CONSIDER
COMMUNITY/HOSPITAL
ASSESSMENT**

MILD

O₂ 95%* or higher
≈ NEWS2 0-2

*Or if O2 sats are 1-2% less than usual

UNLIKELY TO NEED HOSPITAL CARE

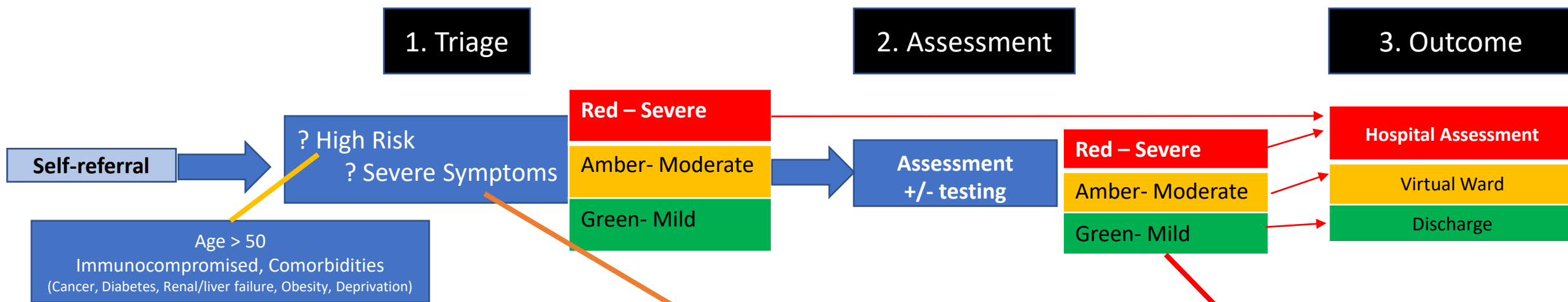
The performance of the National Early Warning Score and National Early Warning Score 2 in hospitalised patients infected by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)

Ina Kostakis^a, Gary B. Smith^{b,*,}, David Prytherch^a, Paul Meredith^c, Connor Price^a,

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

^a Matthew Inada-Kim, ^b Francis P. Chmiel, ^c Michael J. Boniface, ^d Helen Pocock, ^e John J. M. Black, ^f Charles D. Deakin

PLAN A Triage, Assessment & virtual care (if hospitals are not overwhelmed)

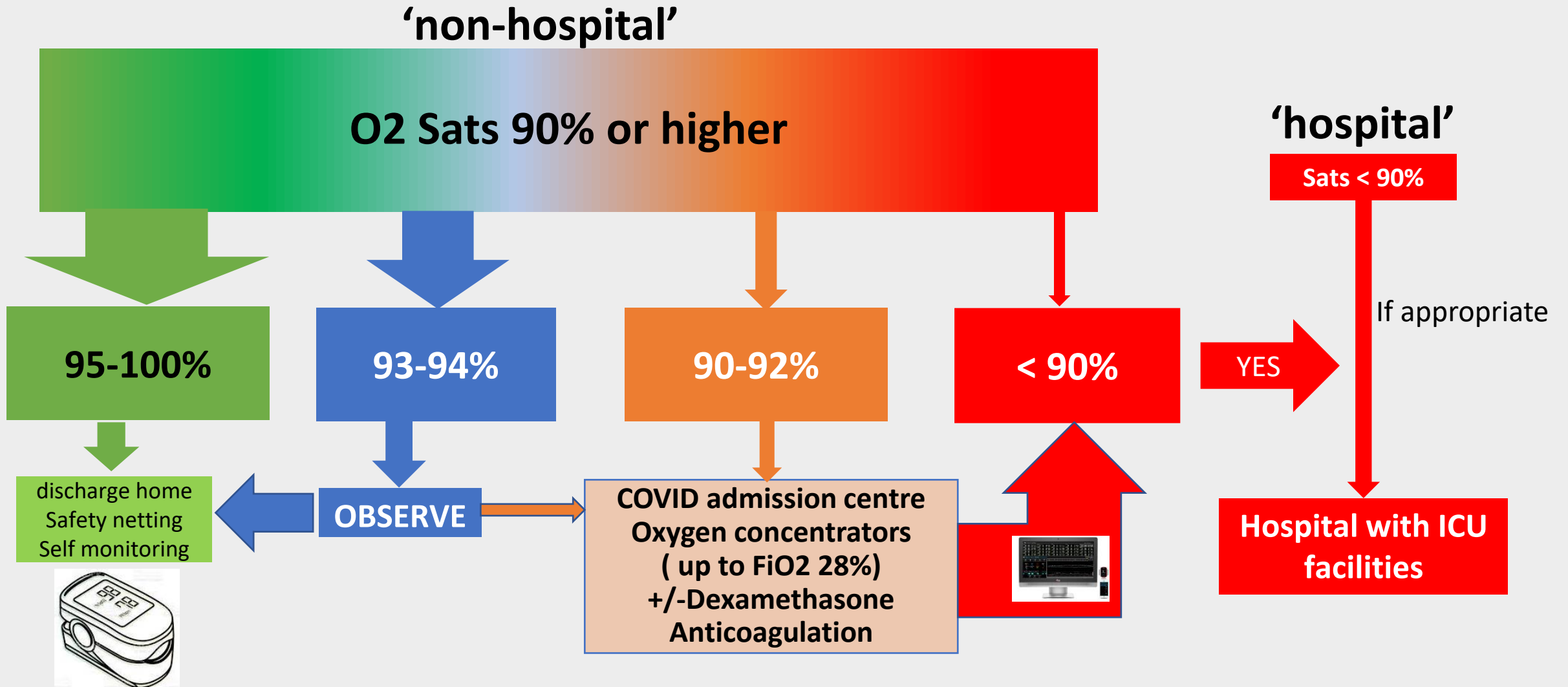


Assessment Severity	Children	Adults	Advice
Red - Severe	<ul style="list-style-type: none"> Evidence of darkening or changing colour to lips Pauses in their breathing (apnoea) or has an irregular breathing pattern or starts grunting Severe difficulty in breathing – too breathless to feed Becomes pale, 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 38C/100.4F or above (unless fever in the 48 hours following vaccinations and no other red or amber features) 	<ul style="list-style-type: none"> 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) Develop a rash that doesn't fade when you roll a glass over it Stopped passing urine or are passing urine much less than usual 	Urgent help please phone 999 or attend the nearest Hospital Emergency (A&E) Department within an hour.
Amber – Moderate	<ul style="list-style-type: none"> Has laboured/rapid breathing or they are working hard to breath - 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) Is becoming drowsy (excessively sleepy) AMBER Seems to be getting worse or if you are worried	<ul style="list-style-type: none"> 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	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
Green - Mild	<ul style="list-style-type: none"> If none of the features in the red or amber boxes above are present. 	If none of the features in the red or amber boxes above are present.	Self Care Using advice provided you can provide the

ADULT	O2 sats	NEWS2	Worry
SEVERE	92% or lower	5 or more	High
MODERATE	93-94%	3-4	Moderate
MILD	95-100%	0-2	Mild

PAEDS	Oxygen sats	Worry
SEVERE	92% or lower	High
MODERATE	93-94%	Moderate
MILD	95-100%	Mild

PLAN B Low Acuity Admission units **IF** hospitals are overwhelmed



MILD COVID

Always consider non-COVID causes

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

High Risk ≥ 50 , Comorbidities/HCP/SOB/Clin.worry,

Low Risk < 50 , No Comorbidities, no Clinician worry

In the majority, full recovery is usual within 4 weeks


When NOT to contact health services for help

[CEBM symptoms severity predictor](#)

Odds ratio of death/admission	
Sputum	1.3
Dizziness	1.3
Cough	1.1
Nausea or vomiting	1.0
Diarrhoea	1.0
Headache	0.8
Sore throat	0.8
Nasal Congestion	0.6


Patient instruction and info is critical

What symptoms are usual?


**Mild COVID-19 symptoms**

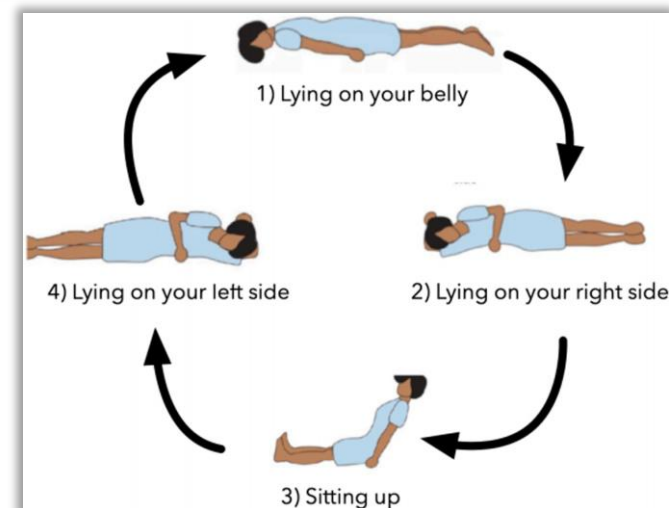
These are common symptoms. You may not have all of these but still feel unwell.

- High temperature: you feel hot to touch on your chest and back. If you have access to a thermometer, a reading of 38 degrees celsius or higher
- Cough
- Muscle ache or tiredness
- Mild chest pain
- Dizziness or headache
- Loss of taste or sense of smell
- Diarrhoea and vomiting
- Rashes.

**Supporting your recovery**

- Most people recover from coronavirus within four weeks.
- You may have mild symptoms and feel unwell for a short time before slowly starting to feel better.
- To help you recover, you may wish to try:
 - Rest
 - Paracetamol or ibuprofen (providing there is no medical reason for you not to take it)
 - Regular fluids
- Coronavirus can leave some people feeling unwell for a long time - this is known as long COVID.





SEVERE COVID

TRENDS

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

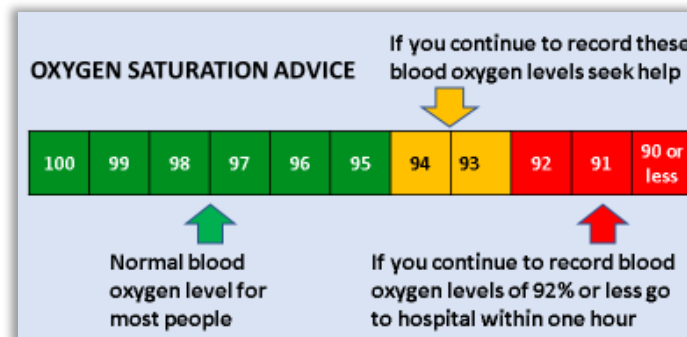
Empower patients to call back if they get worse

Timings of patients who deteriorate
Days 5-7 Silent hypoxia
Days 7-11 Significant breathlessness
Beware of a reduction in O₂ sats

Increase frequency of contacts days 4-9

- Your breathing gets worse **suddenly**
- You are unable to complete short **sentences** at rest
- New breathlessness at rest

	Odds ratio of death/admission
BREATHLESSNESS	4.3
Severe MYALGIA	2.0
CHILL / RIGORS	2.4
Severe FATIGUE	1.4



When Should I worry? What symptoms are most dangerous?

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).

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:

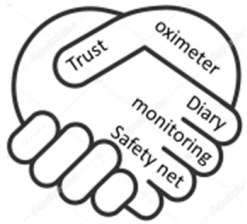
- Your blood oxygen levels are 92% or less (retake your reading immediately first)
- You are unable to complete short sentences when at rest due to breathlessness
- Your breathing gets worse suddenly.

OR if you develop these more general signs of serious illness:

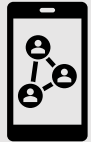
- Cough up blood
- Feel cold and sweaty with pale or blotchy skin
- Collapse or faint
- Develop a rash that doesn't fade when you roll a glass over it
- Become agitated, confused or very drowsy
- Stopped passing urine or are passing urine much less than usual.

You should tell the operator you may have coronavirus and if you use a pulse oximeter give your oxygen saturation reading. These symptoms require urgent medical attention.

Aligned Patient Pathway



Patient reassurance & partnership is key



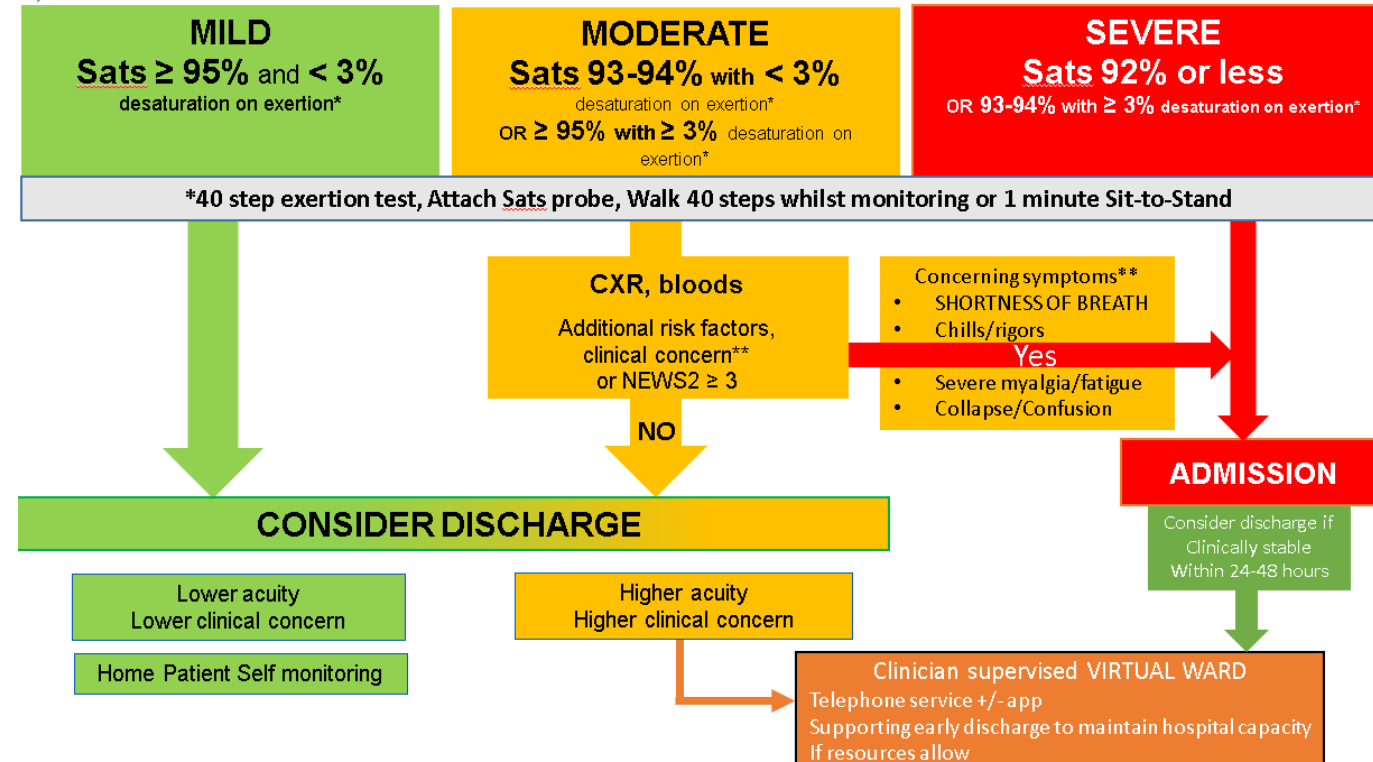
Patient at home

Deterioration

Hospital



Blood Oxygen Level	What to do / When to seek help
95-100%	Stay at home and continue to check your blood oxygen level regularly
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 <ul style="list-style-type: none"> Shortness of breath Chills/high fever Severe aches/tiredness Collapse/Confusion
92% or below	Check your blood oxygen level again straight away If its still 92% or below go to hospital immediately



Does Earlier Admission through home monitoring improve outcomes?

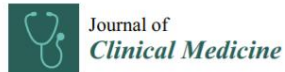
COVID Oximetry @home: evaluation of patient outcomes

Michael Boniface¹, Daniel Burns¹, Chris Duckworth¹, Franklin Duruiheoma², Htwe Armitage², Naomi Ratcliffe², John Duffy², Caroline O'Keeffe³, Matt Inada-Kim²

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)

	No Home monitoring	Home Self monitoring
Average Length of stay	13.2 days	6.9 days
Deaths within 30 days	20.5% (130 / 633)	5.8% (8 / 137)
ICU	8.2% (52 / 633)	3.6% (5 / 137)
Readmissions within 30 days	8.7% (55 / 633)	0% (0 / 137)

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



Article Efficacy of Telemedicine and Telemonitoring in At-Home Monitoring of Patients with COVID-19

Emilio Casariego-Vales^{1,2,*}, Rosa Blanco-López³, Benigno Rosón-Calvo⁴, Roi Suárez-Gil¹, Fernando Santos-Guerra⁴, María José Dobao-Feijoo³, Ramón Ares-Rico⁵, Mercedes Bal-Alvaredo¹ and

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 ($p = 0.03$).

COVID-19 Clinical management

Living guidance
25 January 2021



Conditional recommendation for

For symptomatic patients with COVID-19 and risk factors for progression to severe disease who are not hospitalized, we suggest the use of pulse oximetry monitoring at home as part of a package of care, including patient and provider education and appropriate follow-up (conditional



COVID REMOTE MONITORING AND MANAGEMENT AT HOME

Wednesday 5 May, 8.30-9.30pm (India Standard Time) / 3-4pm (UK BST)

This is the first in a series of UK-India COVID-19 webinars from the South Asia Health Foundation and the Academic Health Science Network (AHSN Network), sharing our experiences of COVID-19 and the use of pulse oximetry in the UK, with health and care professionals in other countries.

- Lessons learned from the UK's National Health Service – COVID Oximetry @home and COVID virtual ward models
- A COVID early warning system
- Tips for treating silent hypoxia
- Resources available
- Question and answer session

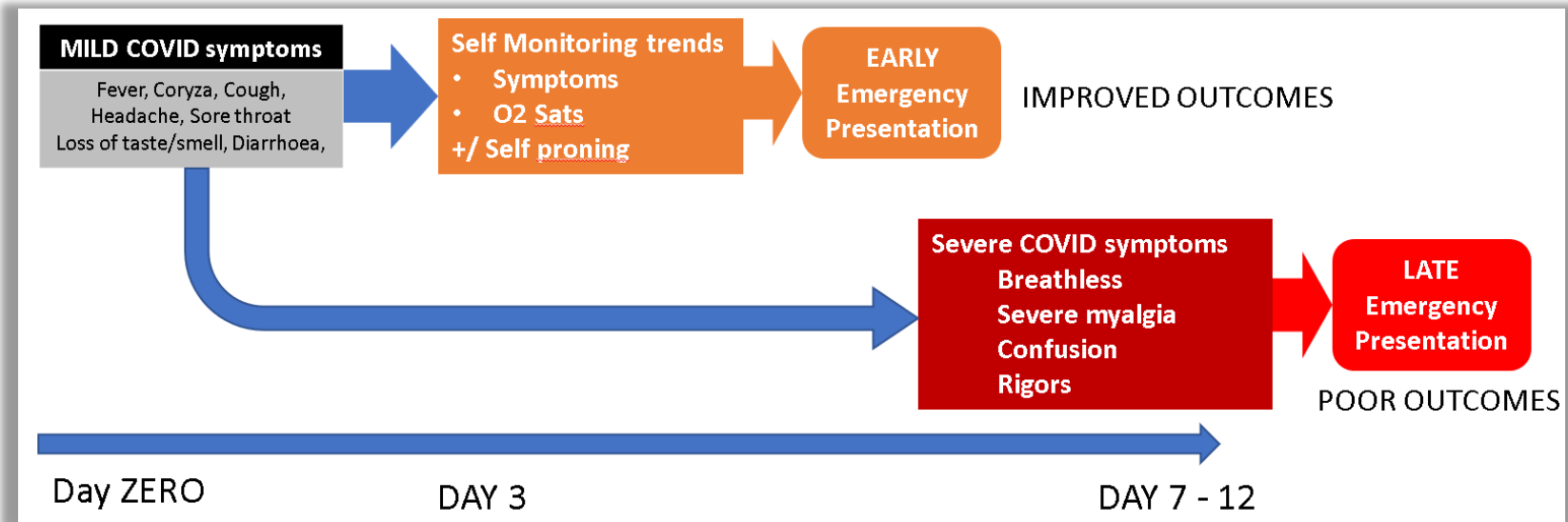
EMPOWERING PATIENTS with knowledge +/- devices for how to spot & escalate deterioration

Protecting patients- Earlier presentation

- Reducing **mortality**
- Reducing hospital **length of stay** (& ICU)

Protecting healthcare systems-

- Reducing **admissions**
- Expediting **discharge**



Thanks for listening!  @mattinadakim