WHY?

~~Late~~ Early presentations

Silent hypoxia

56 year old, usually well man with a PMH of hypertension/asthma

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

21.4 1st NHS call

23.4 2nd NHS call Terrible cough, joint pains

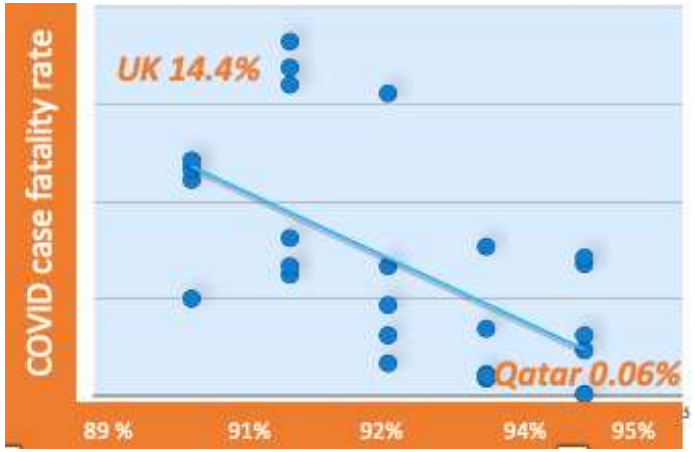
24.4 3rd NHS call asked if he was breathless & if he could walk upstairs

24.4 partner was admitted with hypoxia via ambulance

28.4 Damian died

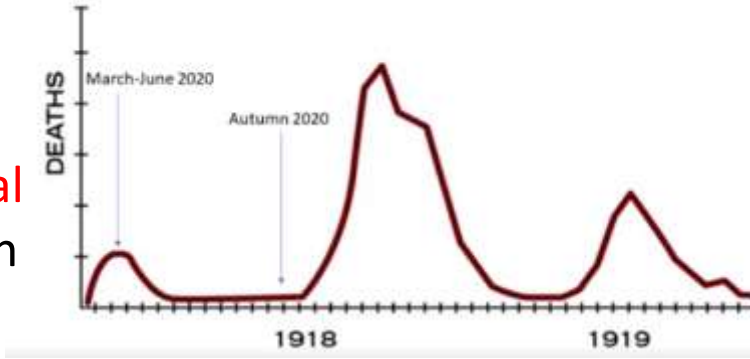
"a characteristic of this virus that causes oxygen saturation levels of some sufferers to fall to dangerously low levels without them suffering conspicuous difficulties when breathing."

The battle for lives will be won in the community



It is GPs, paramedics & ED staff who will shift the balance & save most lives.

It will be clear, sound triage systems & clear clinical guidelines that will determine mortality more than the total number of ventilators available"



Empowering COVID-19 patients with Pulse oximetry @home to self-monitor & spot & act on early deterioration

Matt Inada-Kim, Consultant Acute physician, HHFT, Clinical Director Patient Safety/Digital, Wessex AHSN
National Clinical Lead Deterioration/Sepsis, COVID Clinical Reference groups- primary care, care homes, secondary care

Every household should have an oximeter as well as a thermometer, suggests new study. I ordered one yesterday... #COVID19 Thanks for help from @mattinadakim and @trishgreenhalgh

The Telegraph

Covid patients should seek early treatment, as study warns of danger in even a sli...
The findings suggest current NHS guidelines on blood oxygen levels may be set too high
telegraph.co.uk

Mail Online

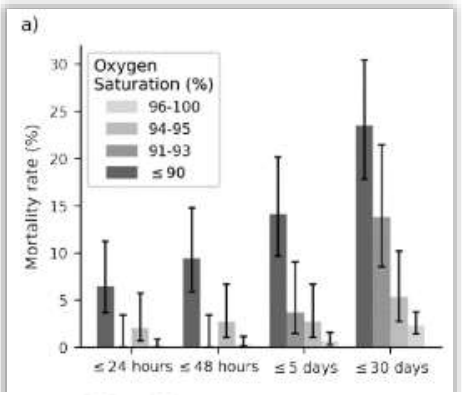
Covid-19 patients whose oxygen levels drop even slightly below 96% may face a greater risk of dying and current NHS guidelines aren't sensitive enough, study warns

- British researchers said the current NHS guidelines may be too relaxed
- They say blood oxygen levels between 94 and 98 per cent are 'normal'
- But the study found drops below 96 per cent correlated with death
- It suggests Covid-19 patients told to stay at home needed early treatment

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 Boniface, Helen Pocock, John J. M. Black, Charles D Deakin

https://www.medrxiv.org/content/10.1101/2020.11.06.20225938v1



Keeping it simple

The first study examining home oxygen saturations as a trigger for initial hospital assessment

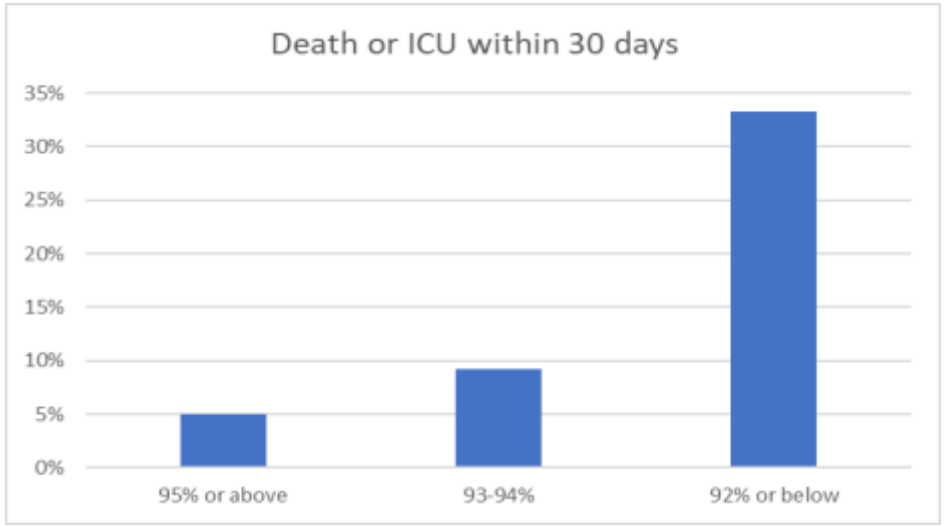
even patients with presenting oxygen saturations of 94-95 %, values regarded as within this normal range, had a significantly (p=0.045) higher 30-day mortality rate (5.3 %) than those presenting with oxygen saturations higher than 95 % (30-day mortality rate 2.3 %)

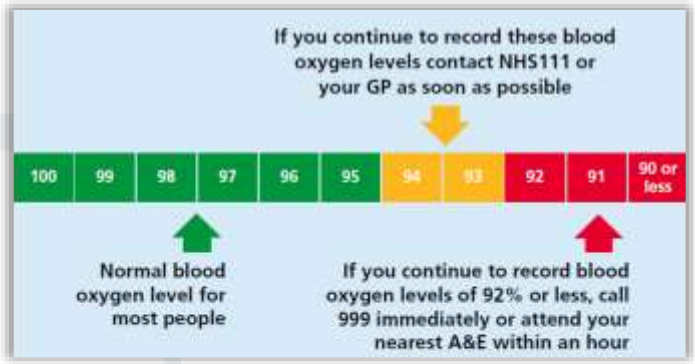
BREAKING First paper examining home oxygen saturation in COVID confirmed cases as a trigger for initial hospital assessment. We need to rapidly implement a hybrid community-hospital COVID Oximetry@home #COVIDvirtualward @richardhorton1 @bmj_latest
medrxiv.org/content/10.110...

292 Retweets 122 Quote Tweets 719 Likes

"a lower threshold for hospital conveyance may be necessary for patients who traditionally would be considered to have only minor physiological derangement and otherwise have been left at home"

the importance of oxygen measurement

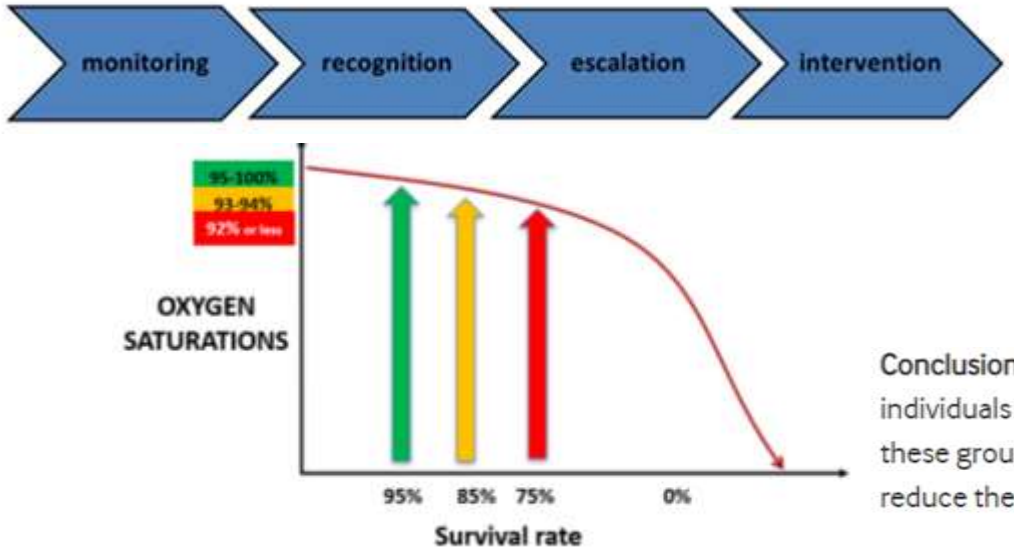




When to get medical help

Blood oxygen level	What to do
95 to 100	Stay at home and continue to check your blood oxygen level regularly
93 or 94	Check your blood oxygen level again within an hour – if it's still 93 or 94, call 111 or your GP surgery for advice
92 or below	Check your blood oxygen level again straight away – if it's still 92 or below, go to A&E immediately or call 999

COVID Oximetry@home Deterioration Recognition system



..and early admission

Retrospective cohort study of admission timing and mortality following COVID-19 infection in England

Ahmed Alaa[1], Zhaozhi Qian[2], Jem Rashbass[3], Jonathan Benger[3], Mihaela van der Schaar[2]

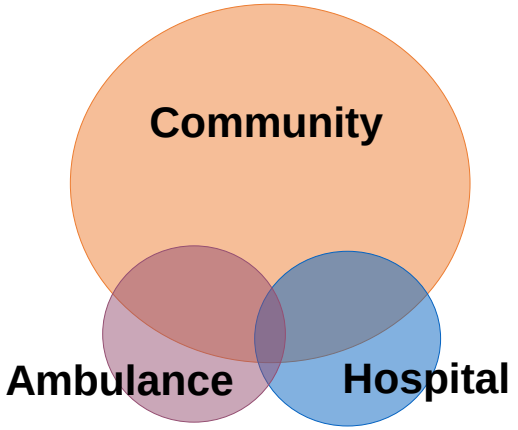
Conclusion The timing of hospital admission is associated with mortality in patients with COVID-19. Healthcare workers and individuals from a BAME background are at greater risk of later admission, which may contribute to reports of poorer outcomes in these groups. Strategies to identify and admit patients with high-risk and those showing signs of deterioration in a timely way may reduce the consequent mortality from COVID-19, and should be explored.

HOW?

COVID Clinical strategy

To improve outcomes/LOS/ICU admission rate through earlier recognition of deterioration

1. Establishing the optimal clinical model in all settings



Aligned pathways

- Consensus formed through National COVID Clinical Reference Groups

Remote assessments

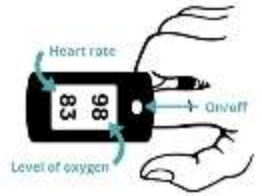
- remote consultations where possible with reduced face to face appointments.
- For COVID and all other conditions

COVID Virtual Ward

- Monitoring suspected COVID patients at home for ‘Silent hypoxia’ and early deterioration at home
- Enabled with Pulse oximetry monitoring

Safety Netting

- Sent/kept at home from all settings (e.g. hospital, community, care home, ambulance)

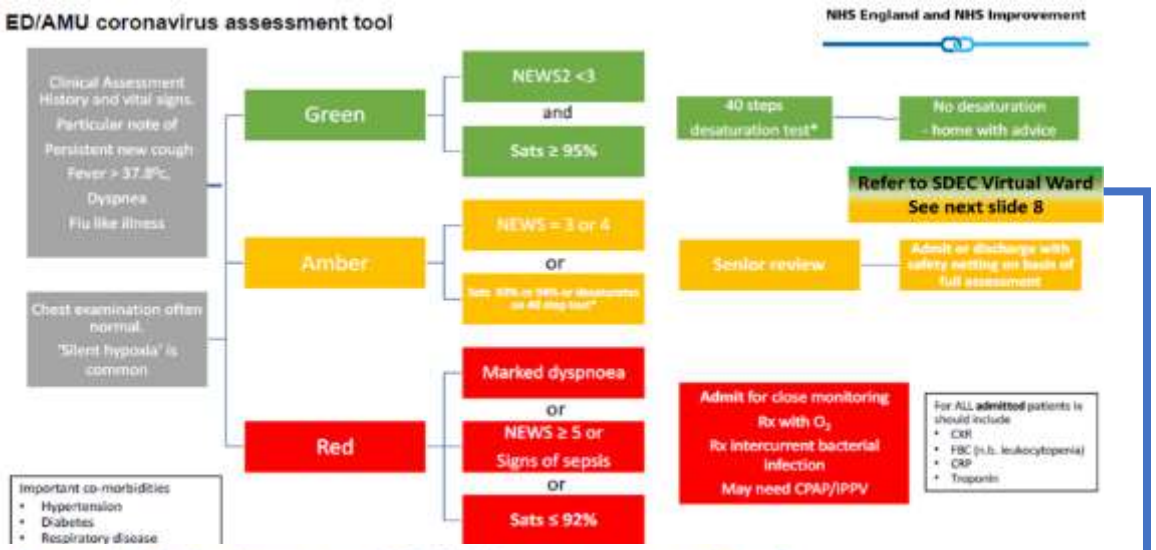


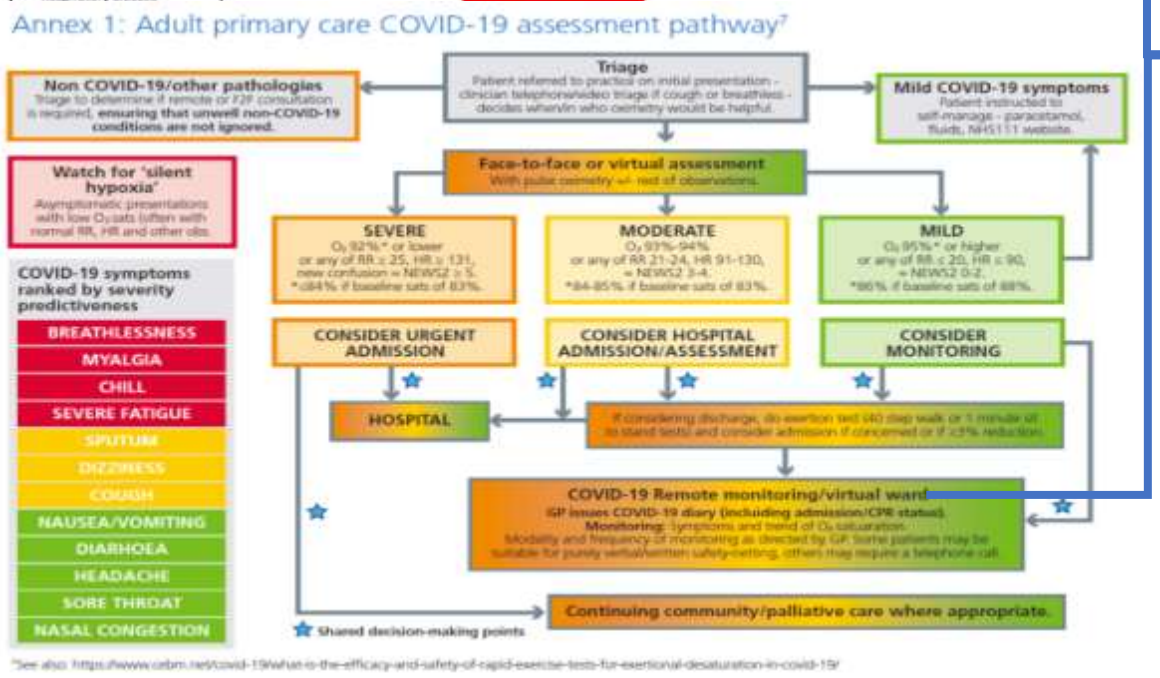
2. Digital supporting innovations (that are interoperable & bridge all settings)

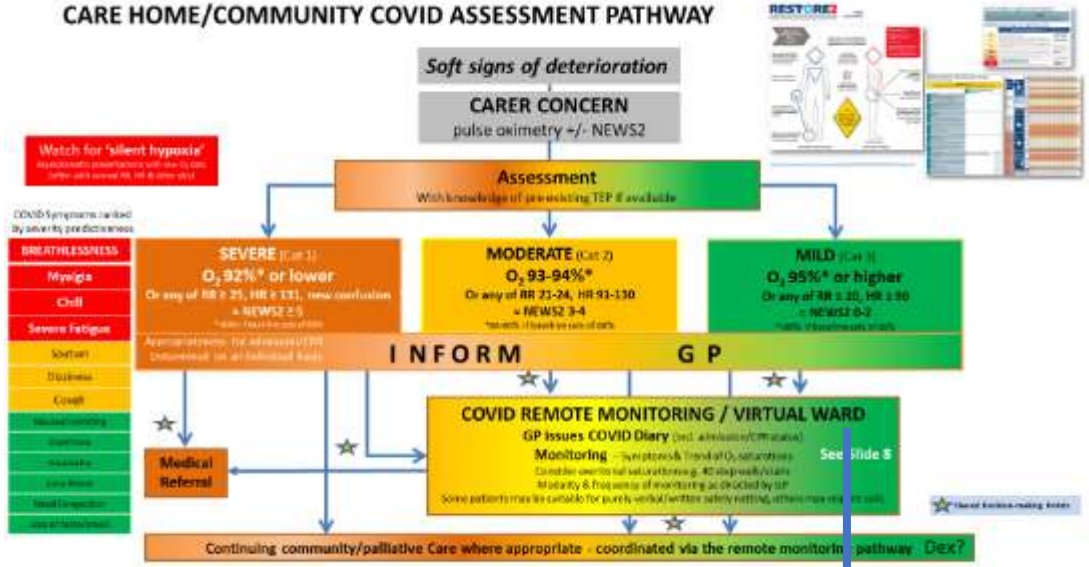
3. Evaluation (NHS Digital, Ara Darzi (ICHP), UCL, NIHR, PHE, Nuffield Trust)

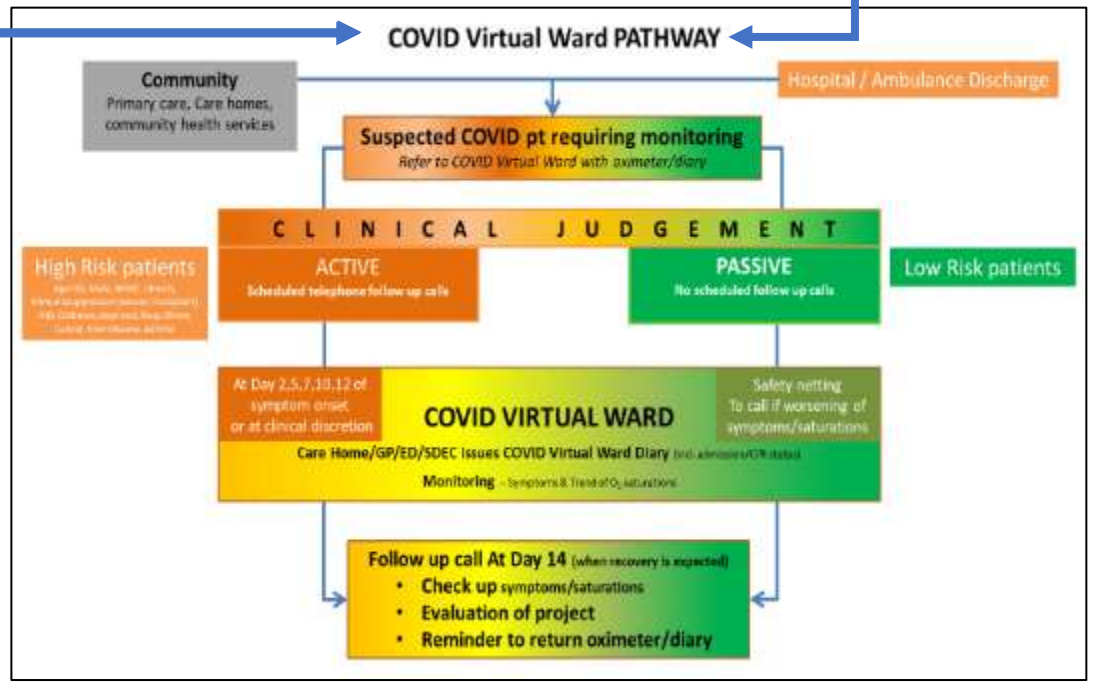
4. Scale & Spread Very strong clinical/patient support

Aligned national pathways across all settings









High Risk non-admitted patients are 'placed' on the COVID virtual ward

DECISION SUPPORT TOOL for ADULTS WITH CONFIRMED / SUSPECTED COVID (AMBULANCE)

Face to face assessment
Assess using pulse oximetry, history and full set of observations

Always review advanced care/treatment plans**

Chest examination often normal. 'Silent hypoxia' is common
Asymptomatic presentations with low O_2 sats (often with normal RR, HR & other obs)

Non-COVID/other pathologies
Ensure that non-COVID conditions are considered
In particular other causes of deterioration

SEVERE

O_2 92%* or lower

Or any of RR ≥ 25, HR ≥ 131≈ NEWS2 ≥ 5

*Or if O2 sats >4% less than usual

HOSPITAL CONVEYANCE with pre-alert

MODERATE

O_2 93 - 94%*

Or any of RR 21-24, HR 91-130

≈ NEWS2 3-4

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

HOSPITAL CONVEYANCE with pre-alert

MILD – must be able to undertake activities of daily living

O_2 95%* or higher

RR ≤ 20 AND HR ≤ 90

≈ NEWS2 0-2

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

High Risk Groups include:
- Age 65 and over
- Age under 65 and
  - COPD
  - Diabetes / BM > 12mmol/l
  - BAME
  - Pregnancy
  - CVD/Hypertension
  - Obesity
  - Cancer
  - Chemotherapy
  - Immunocompromised

If considering non conveyance, do exertion test (40 step walk or 1 min sit-to-stand tests & consider admission if concern or if ≥ 3% reduction.

High risk MUST seek senior clinical advice may be suitable for virtual ward

Not high risk: Consider HOME MANAGEMENT

Remember Safety Netting

v1.3 NHS E / I 01 December 2020

WHAT?

COVID Virtual Ward PATHWAY

Community
Primary care, Care homes, community health services

Hospital / Ambulance Discharge

Suspected COVID pt requiring monitoring
Refer to COVID Virtual Ward with oximeter/diary

1. Diagnosis of COVID-19: either clinically or positive test result **AND**
2. Symptomatic **AND**
3. Aged 65 years or older

OR for patients *under* 65 years at risk of a poor outcome

OR Clinical concern

High Risk patients
Age>50, Male, BAME, obesity Immunosuppression (cancer, transplant) IHD, Diabetes ,deprived, Resp.illness Cancer, liver disease, asthma

C L I N I C A L J U D G E M E N T

ACTIVE
Scheduled telephone follow up calls

PASSIVE
No scheduled follow up calls

Low Risk patients

At Day 2,5,7,10,12 of symptom onset or at clinical discretion

COVID VIRTUAL WARD

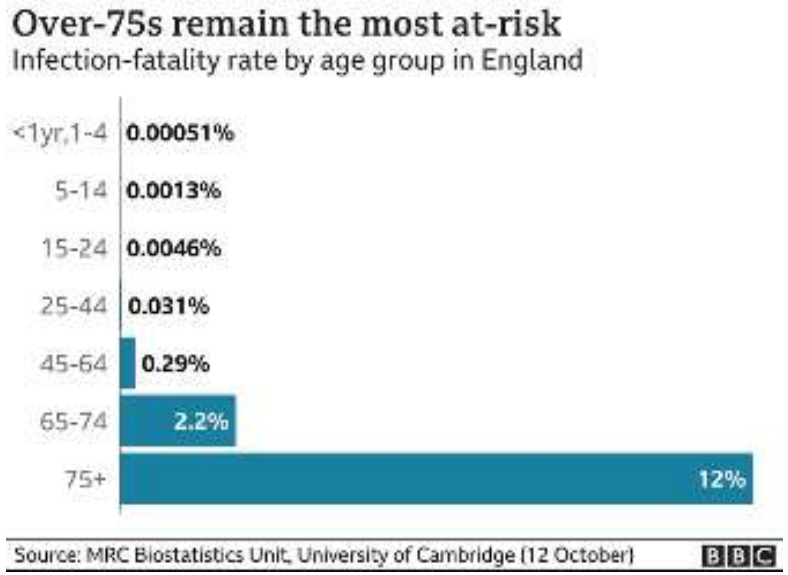
Safety netting
To call if worsening of symptoms/saturations

Care Home/GP/ED/SDEC issues COVID Virtual Ward Diary (incl. admission/CPR status)

Monitoring – Symptoms & Trend of O_2 saturations

Follow up can be undertaken by AHPs/HCPs under the supervision of senior clinicians

- Check up symptoms/saturations
- Evaluation of project
- Reminder to return oximeter/diary



Follow up of suspected or confirmed COVID-19 patients @home

Patient Self-Monitoring (TDS) oxygen sats/symptoms @home

Early escalation (desaturation +/-symptoms) to admit patients as soon as they deteriorate

COVID virtual ward resources

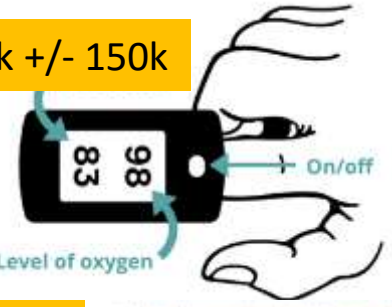
analogue

digital

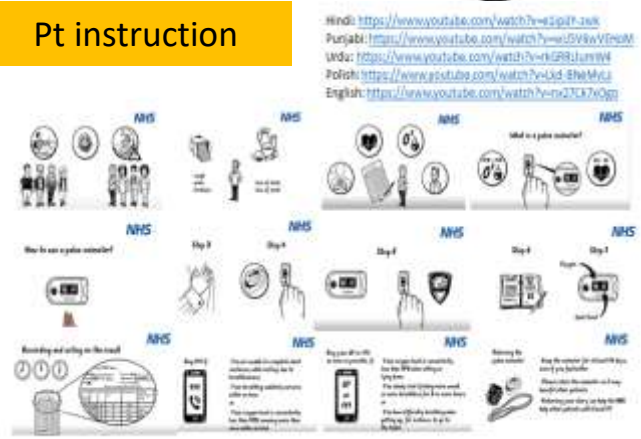
Safety netting

COVID Diary

210k +/- 150k



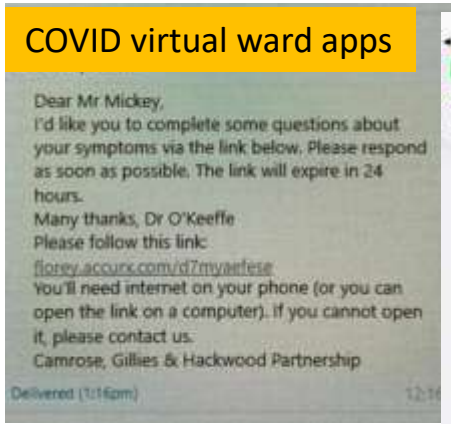
Pt instruction

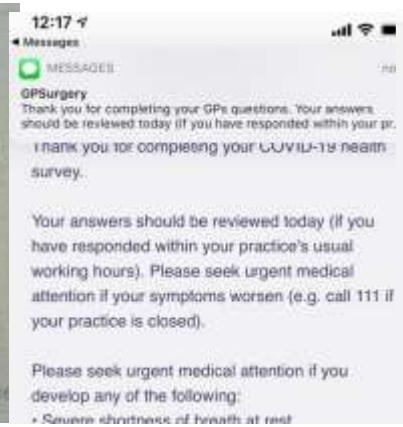


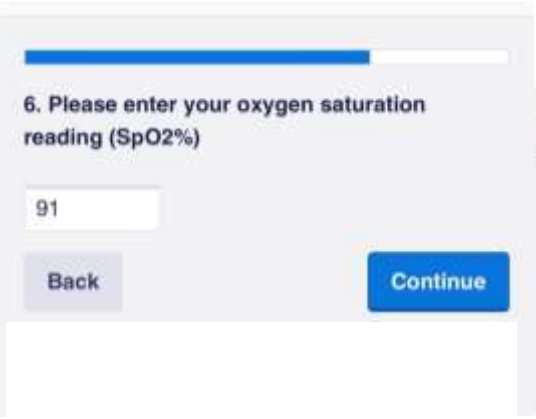
https://www.youtube.com/watch?v=ifnYjD4IKus&feature=youtu.be

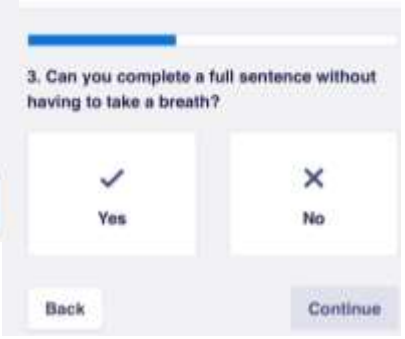
Multilingual translations in progress

COVID virtual ward apps

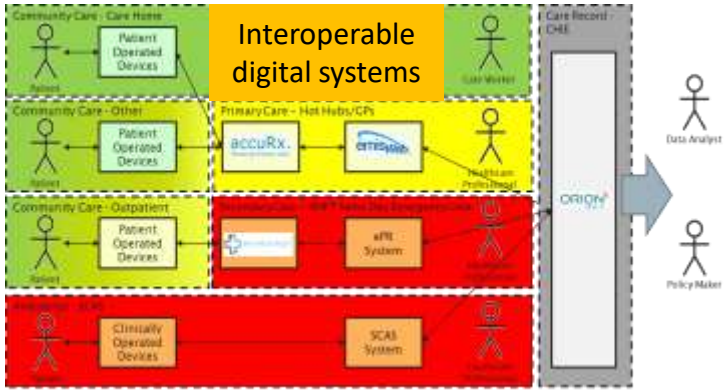








Interoperable digital systems



https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/06/C0445-remote-monitoring-in-primary-care-annex-2-diary.pdf

The Need for Community & SDEC COVID virtual wards

thebmj covid-19 Research Education News & Views Campaigns Jobs

News » EXCLUSIVE

Covid-19: Patients to use pulse oximetry at home to spot deterioration

SAFE COVID @home CARE

Published 27 October 2020

Covid-19: Patients to use pulse oximetry at home to spot deterioration

Ingrid Torjesen

Patients with covid-19 who don't need immediate hospital attention but are at high risk of developing serious symptoms are to be given pulse oximeters to use at home to reduce the risk of serious deterioration, *The BMJ* has learnt.

NHS England is believed to have purchased around 200 000 pulse oximeters for the scheme, which clinical commissioning groups across England will be able to access.

The initiative is set to be rolled out across the country over the next six weeks and is being led by Matthew Inada-Kim, national clinical lead for deterio… NHS England and a consultant in acute and … medicine at Hampshire Hospitals NHS Fou… Trust.

NHS England has advised since the start of … pandemic that medical intervention is necessary if oxygen saturation levels began to fall.[1] But during the first wave it became clear that some patients developed "silent hypoxia," where desaturation occurred but they exhibited no obvious symptoms, such as shortness of breath or feeling very unwell. These patients tended to require invasive respiratory support and had poor outcomes.

Nigel Watson, chief executive of Wessex Local Medical Committees, which is expected to be one of the first areas to implement the monitoring at home scheme, told *The BMJ* that the evidence was now fairly strong that if oxygen saturation fell to 94% or 93% the mortality risk increased to around 13%, and if it fell below that level the risk would increase to to make the recovery almost impossible." But he pointed out that this would put more pressure on the hospital system.

"As we monitor more patients in the community, we will know what the tipping point is for them to get into hospital, which is likely to be earlier than we might do if we weren't monitoring them at all," he said. "So, the recovery will be better, but actually I think it inadvertently means we're going to have even more patients in the hospital."

NHS England and Inada-Kim were asked for comment

Ambulance COVID study
617/1080 had Sats 95-100%

I was at work today and again tomorrow .. it's all hands on deck .. we are overwhelmed and ran out of ITU capacity last night Patients ventilated in theatre recovery
We managed to get more patients out on the CVW pathway
Every little helps and more and more patients being added to the CVW pathway —> this

'Flow' is critical to Patient Safety

EARLY DISCHARGE

ADMISSION ADVOIDANCE

Just to let you know. COVID virtual ward started this week in [redacted] (mobilised within 2 weeks after I had been nudging for months and finally things lined up for a decision). 48 patients admitted to it in 1 week! I am doing the MDT for it twice a week (it happens daily Monday to Friday within GP, AP and community nurses) from Monday.

Well done thaT's fantastic. Really hope it helps improve outcomes and helps keep the flow going

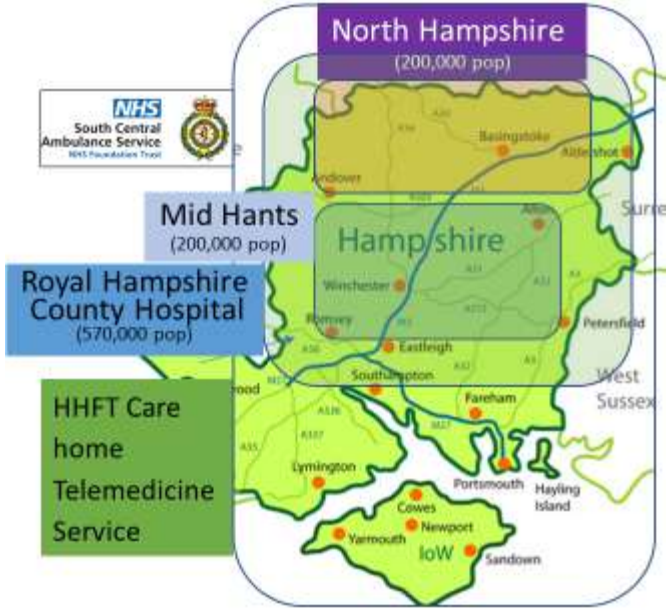
Now 108 patients on COVID VW in 2 weeks and another 52 discharged from it

This is absolutely amazing team work this morning 👌 AED full and no space on unit shows what is necessary to create capacity and discharge patients safely. Amazing dedication 😊👏 @JanChristian66 @skimmingstones1 @mattinadakim

EAU @ SRFT @NEWSEAU · Oct 28

Covid Virtual Ward set up in less than an hour and first person discharged. Special thanks to @bushra_alam1, @EprSrft and all the EAU team for making this happen. Looking forward to collaborative work with the community to progress and expand this initiative ❤️

SCALE & SPREAD - Share monitoring for all settings



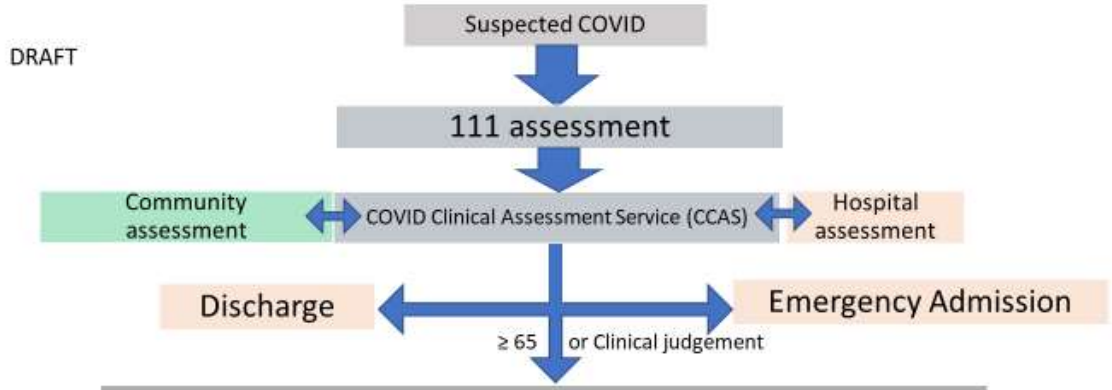
NOW
2 Community hot hubs
1 hospital SDEC
100 Care homes
1 Ambulance trust
Covering 600k people

FUTURE
9 Community hot hubs
5 hospital SDEC
600 Care homes
1 Ambulance trust
Covering 2 million people

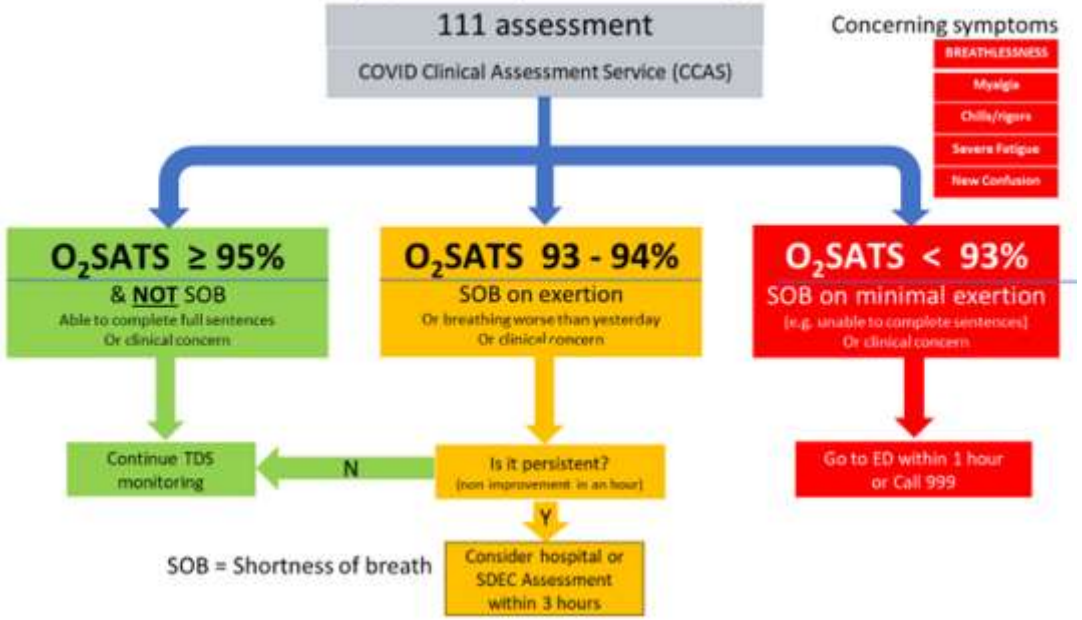
2,000 COVID/non COVID patients managed so far
0 deaths (!) from 130 SDEC/Winchester city COVID virtual ward pt
COVID virtual wards- 1,800 patients- 1690 discharges (110 admissions)
Care home Telemedicine avoided conveyance in 138/269 cases
Enabled remote prescriptions in 84/269 cases

ROI
- **> 10% Reduction in COVID mortality**
- **> 35% Reduction in ED COVID admissions**
- **> 20% Reduction in hospital admissions from care homes**
- **5 hour Reduction in clinician time / day / virtual ward**

COVID Oximetry @home (Virtual Ward) onboarding and monitoring



COVID Oximetry @home (Virtual Ward) DETERIORATION



COVID Virtual Ward Staffing Competencies/Training

With thanks to Helene Irvine
Sam Sherrington & team

STAGE 1
Referral via 111/999/GP Practice, Hospital or Community
Registered Professional

STAGE 2
Triage at hot hub or by phone
Registered Professional

STAGE 3
Onboarding to COVID Oximetry@home
HCSW & Volunteer

STAGE 4
Patient monitored for up to 14 days by a HCSW
Clinical 'check-in' phone calls on days 2, 5, 7, 10 and 12
HCSW with supervision

STAGE 5
Recovery and discharge
Registered Professional

Stage 1
Registered Professional competent in assessment of COVID-19 respiratory conditions and uses clinical judgement to diagnose and assesses against COVID pulse oximetry inclusion criteria

Stage 2 referral to Primary care Hot hub or other.
The Registered Professional will be capable and competent in:
- understanding the process and entry criteria for the Covid-19 pathway

Stage 3
Role of the HCSW
Involved in monitoring of the individual
Liaises with designated volunteers to deliver oximeter equipment
Competent in the ability to record and monitor an

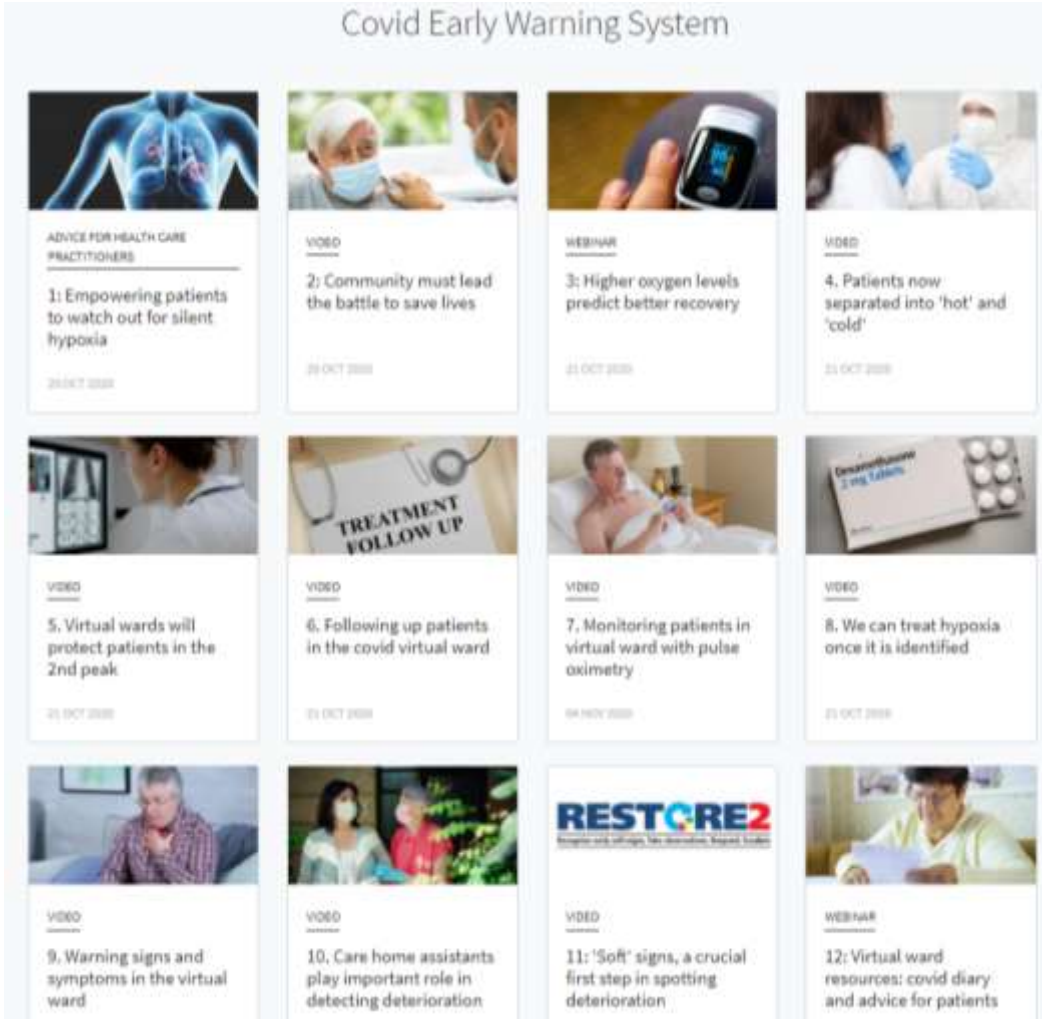
Stage 4
- HCSW contacts the individual following the agreed proforma to check compliance
- Checks that the individual is safely and accurately using the equipment
- Is able to answer any questions eliciting support from a health

Stage 5
Registered Professional competent in clinical assessment and decision making to have the confidence and capabilities to discharge the individual from the care pathway
HCSW
Liaises with volunteers to arrange & return oximeter adhering to IPC measures

HSJ TRAINING

With thanks to Susannah Benady

https://training.hsj.co.uk/covid-early-warning-system-saves-lives



National deterioration & COVID Forum

600 members, 25 new posts/day, 250 views/day **Come join us !**

Adaptive work

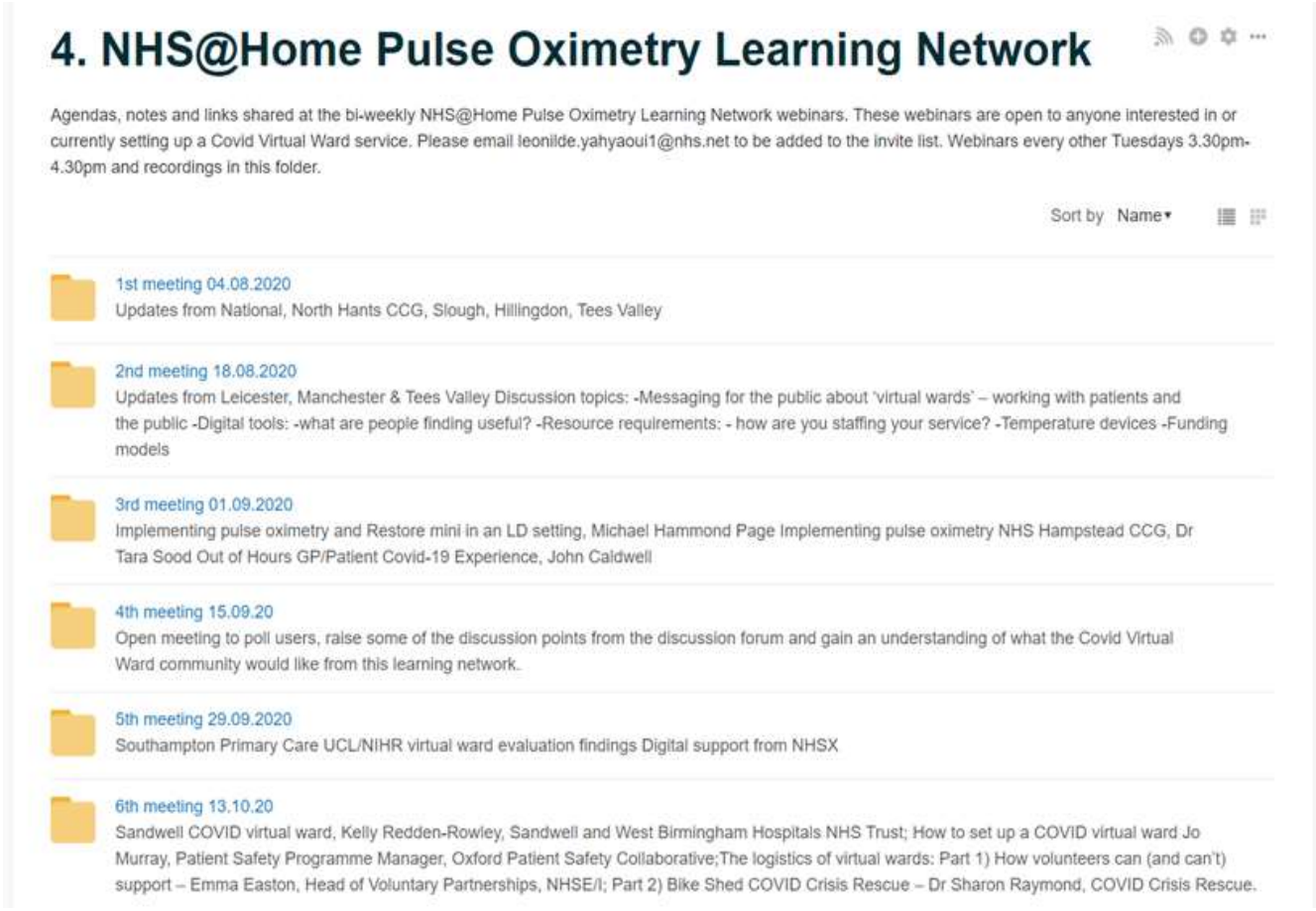
Front line- central engagement

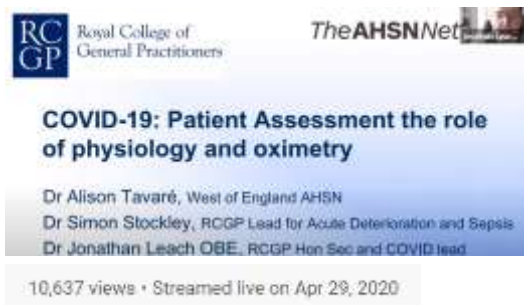
Where is the stress in the system?
Bidirectional flows of information
Collaborative solutions

Fortnightly COVID Oximetry@home learning network

Come join us !

- is a tool that uses social media and technology to collect, communicate, collaborate and create with connected colleagues anywhere at any time
- Members make requests and share resources
- An opportunity to openly collaborate/share ideas, **resources**, and learning materials with educators anywhere in the world.
- A way to gain perspective on practice/ideas for future innovations
- 7 meetings so far, fortnightly led by Catherine, Tony, Jo, Tara, Samson, Jo, Leoni & matt.70-150 attendees.





Early data suggests potential for large improvements in admissions / LOS and Flow

Unpublished, encouraging early data from colleagues, since implementing the COVID Oximetry@home (virtual ward) at a single site secondary care hospital in October.

COVID Average of Total LOS			
Month	No ICU Bed Days	ICU Bed Days within Spell	Total Avg LO
Apr-20	14.89	27.41	16.72
May-20	26.22	33.00	27.06
Jun-20	31.24	41.20	34.67
Jul-20	34.93	15.50	32.50
Aug-20	18.33	82.50	27.50
Sep-20	5.59	75.44	18.16
Oct-20	7.16	14.79	8.40
Nov-20	9.82	13.67	10.12
Total Avg LOS	**13.91**	**30.43**	**16.27**

https://twitter.com/bushra_alam1/status/1327354628640530432?s=20

Next steps… Come join us ! @mattinadakim

1. Clinical Model

Pathways (111/999/CCAS)
safety netting
CO@h referral pathway/ Inclusion criteria
Training/competencies

2. Implementation (AHSNs)

Engagement, Forming, collaboration
Strategise, Comms, consensus

3. Funding

Oximeters
staffing (CCG funding agreed to start up)

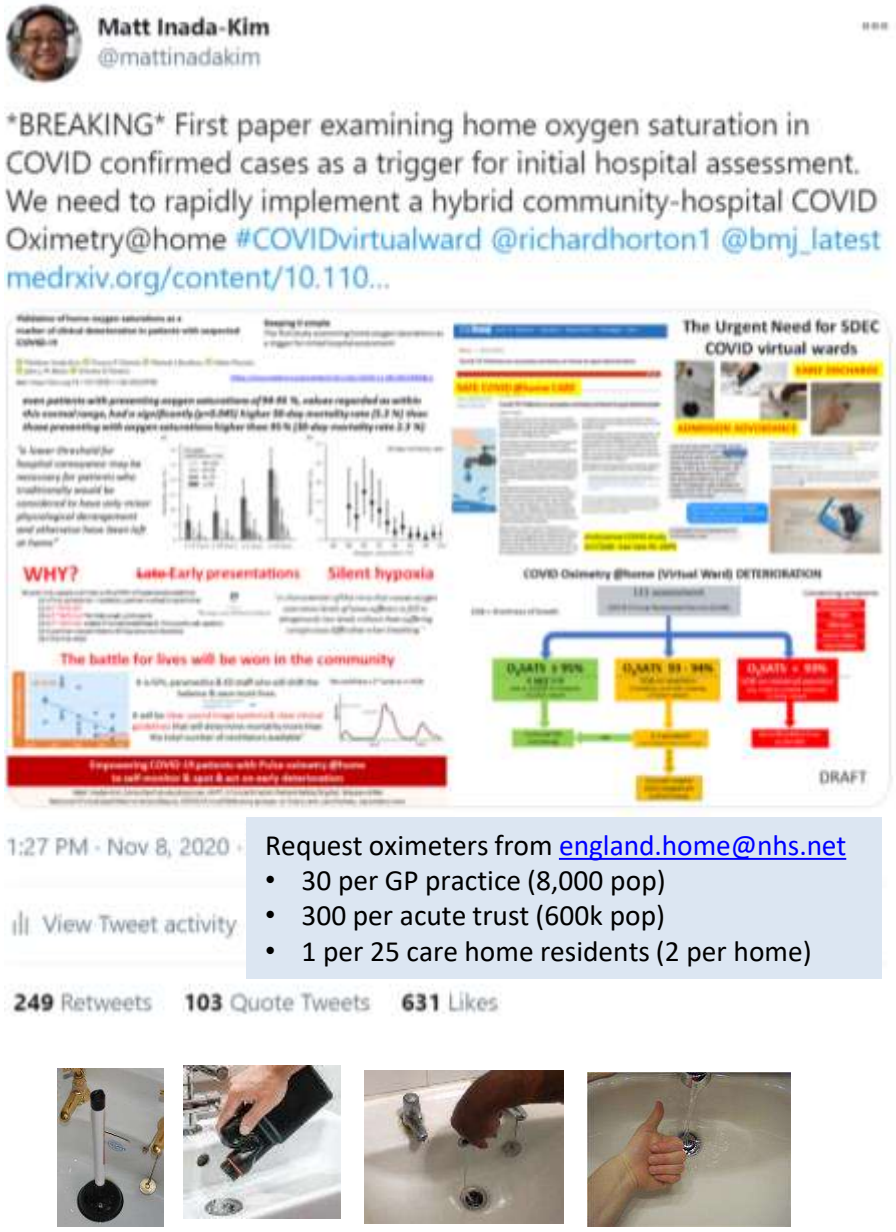
https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0828_GP-funding-letter-_second-wave_9nov.pdf

4. Evaluation

https://www.nuffieldtrust.org.uk/files/vw-evaluation-final-slideset-for-dissemination-12th-oct-2020.pdf

5. Pathways group

Evidence
Safety
Alignment
Development
24/7



Request oximeters from england.home@nhs.net

- 30 per GP practice (8,000 pop)
- 300 per acute trust (600k pop)
- 1 per 25 care home residents (2 per home)

Region	AHSNs
North West	IA, HIM
South East	Oxford, Wessex, KSS
London	ICHP, UCLP, HIN
Midlands	E and WMAHSN
North East	NENC, YH
East of England	EoE
South West	SWAHSN WEAHSN

Pan pathway Collaboration

No one size fits all
(Primary/secondary/step down)
Don't wait for perfection
Can be rapidly set up
Monitoring by lower bands
There are lots of resources

Minimise:
Admissions/LOS/ICU
Mortality

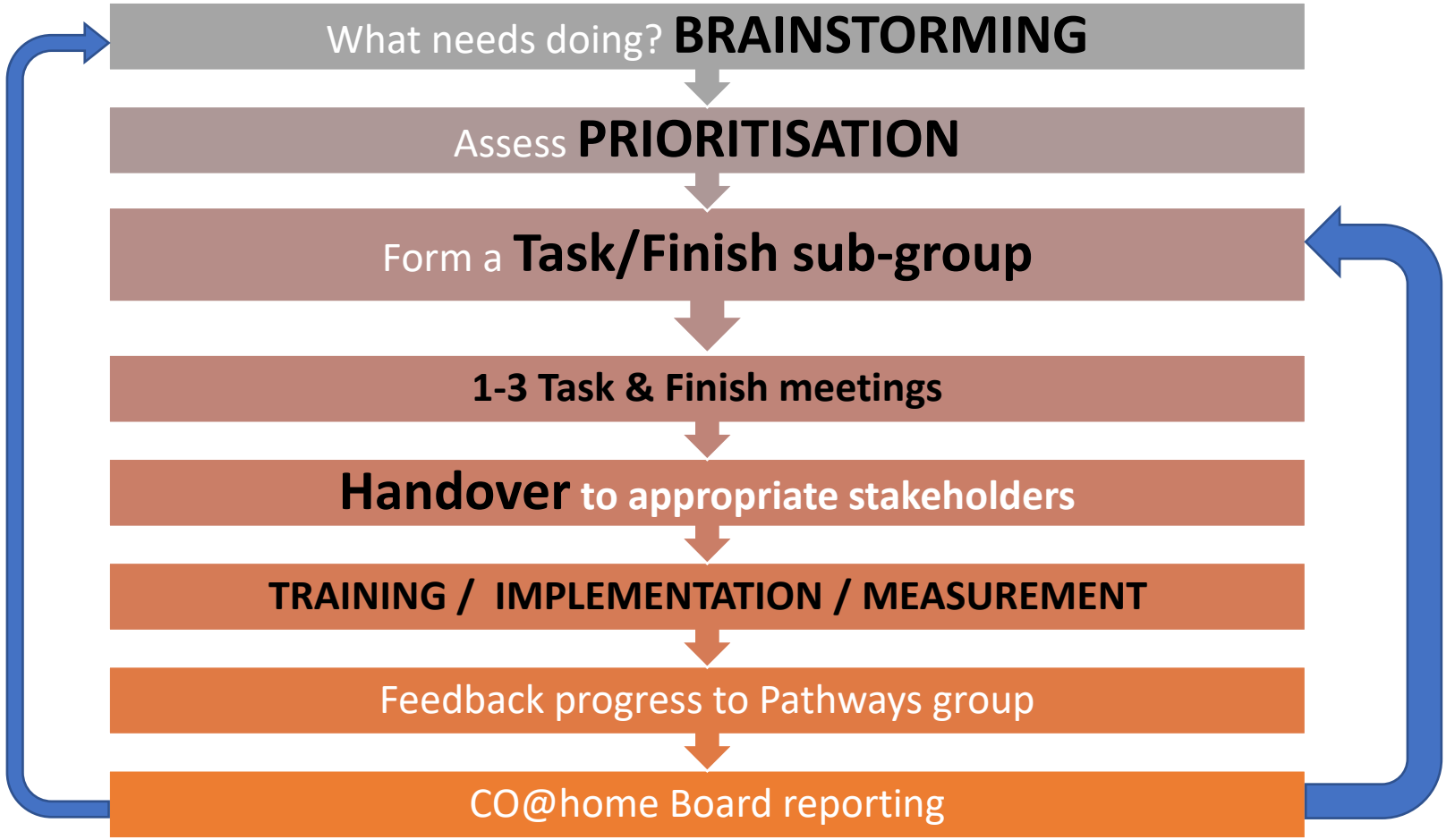
Optimise:
Patient & Staff safety/quality

Early results
1% mortality
N=1,800 COVID patients

NHS COVID Oximetry @home Pathways

Purpose

oversight of the COVID Oximetry @home pathways, inclusion criteria, development and modifications where evolving evidence, safety and need suggests and alignment with all other interrelated pathways.



Program Management	Philip Salter, Kevin McKenna
Chair	Matt Inada-Kim
Director	Tim Straughan
Deputy Director	David Bramley
Waz Baqir	Pharmacy/care homes/Community
Karen Storey	Primary Care Nursing
James Ray	Ambulance/111/call handler/Covid clinical assessment service (CCAS)
Gareth Thomas	NHSx
Karen Kirkham	GP
Adrian Hayter	GP / Care homes
Stephen Hodges Clare Duggan	Strategy and Transformation NW
Rob Moriarty Ali Smith	Lived Experience
Rachel Snow-Miller	Learning disabilities
Jonathan Benger	NHSD

Matt Inada-Kim, Consultant Acute physician, HHFT, Clinical Director Patient Safety/Digital, Wessex AHSN
National Clinical Lead Deterioration/Sepsis, COVID Clinical Reference groups- primary care, care homes, secondary care

CO@h pathways group

Learning and adapting as we go
What needs fixing?
Consensus, Collaborative solutions
Every solution comes with more questions

Evolving evidence

COMMENTARY
High COVID-19 mortality in the UK: lessons to be learnt from Hubei province: are under-detected 'silent hypoxia' and subsequently low admission rate to blame?
J. Deng, Z.Y. Peng, Z.X. Wen, G.Q. Dong, M.X. Xie and G.G. Xu

Retrospective cohort study of admission timing and mortality following COVID-19 infection in England

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. Boniface, Helen Pocock, John J. M. Black, Charles D. Deakin

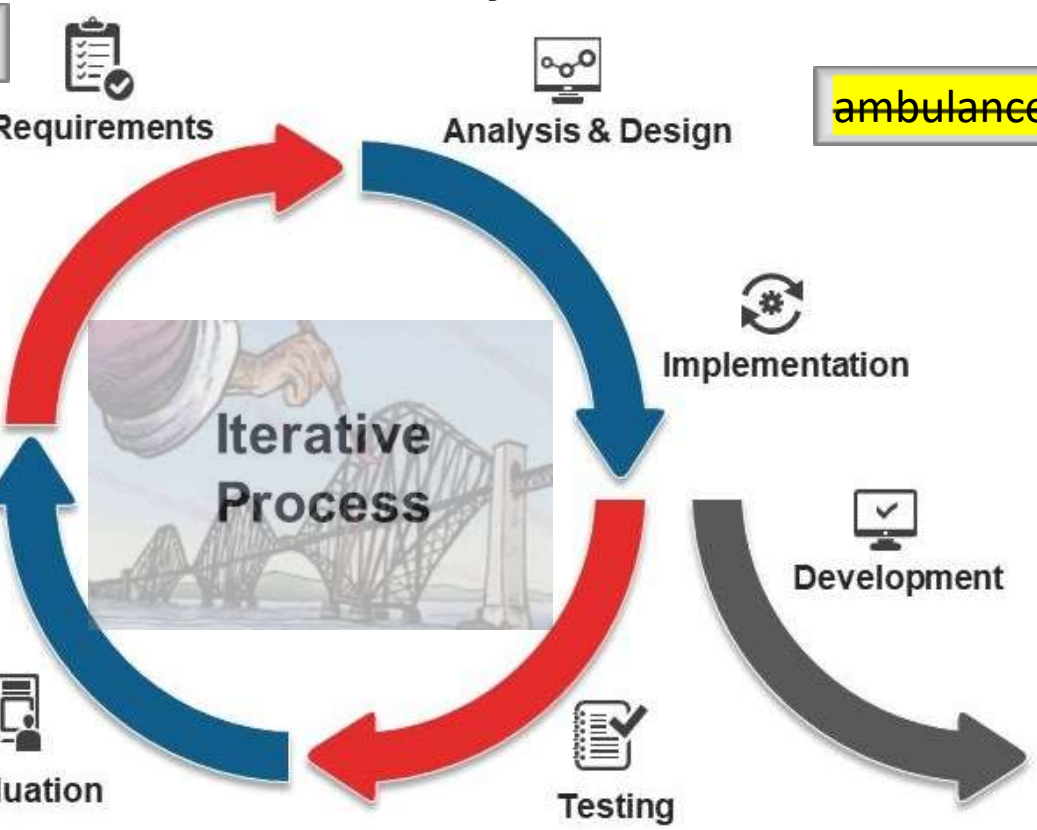
Inclusion criteria

24/7 CO@h
- Referral
- Testing
- Onboarding
- Monitoring
- Escalation

**Needs urgent top office sign off*

Safety netting*

testing



EOL care

SDEC

ambulance

~~111 pathways~~

Poverty

Escalation

BAME

obesity

~~LeD~~

"Half of those who died received care that fell short of good practice"

43% lived in supported living settings
Or with their families
64% lived in a residential/nursing home

> Recommendation made by reviewer
> 'Develop clear protocols during pandemics for care providers and GPs concerning management of infections for people with learning disabilities who may be compromised due to co-morbidities and/or lower physical baselines'.

Deaths of people with learning disabilities from COVID-19

University of BRISTOL

Of those dying
20% had Downs
14% had Autism

All had at least one long-term health condition

39% had lethargy
37% had cough, fever & SOB
None reported Loss of taste/smell

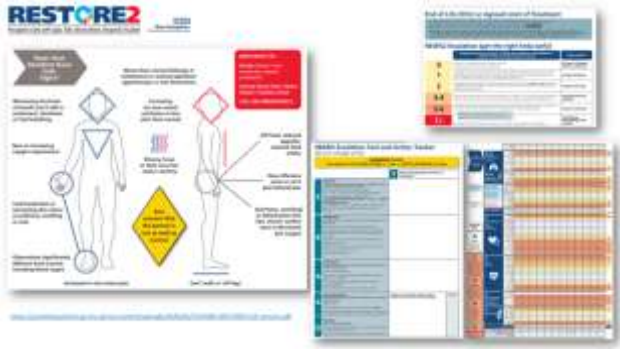
Table 3: The most commonly reported long-term health conditions (ordered by prevalence in COVID-19 patients) of those included in the sample

	COVID19		Other Causes of Death		Total	
Long Term Condition	People with this condition (No.)	People with this condition (%)	People with this condition (No.)	People with this condition (%)	People with this condition (No.)	People with this condition (%)
Mobility impairment	121	74%	32	74%	153	74%
Respiratory conditions	117	72%	26	60%	143	69%
Incontinence	101	62%	31	72%	132	64%
Skin conditions	99	61%	32	74%	131	64%
Mental health needs	96	59%	25	58%	121	59%

Challenges cited:
Raising alarm
Access to NHS111
Access to COVID tests
Absence of oximeters

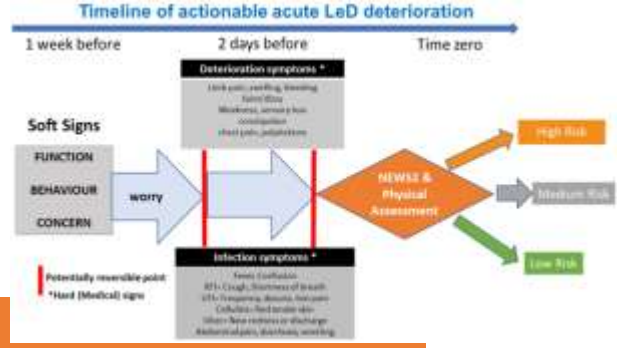
Death from confirmed or suspected COVID-19

Age group	
18-49	21%
50-69	48%
70-84	27%
85 and over	4%
*Total number**	***161***



Recommendations

Deterioration tools for carers
Pay attention to concerns from families/carers
Soft signs of deterioration tools
Pulse oximeters



WE MUST

- **Include ALL ADULTS (18 or above) with a LeD in CO@h**
- **Develop all cause LeD Deterioration pathway**
- **Develop how to spot/escalate deterioration e-learning for all Carers**

24/7 Clinician referral for testing and CO@h onboarding

Patients seen by clinicians currently **self refer** for COVID tests

ILL PATIENT with Possible COVID

Risk Assessment

ADMIT

HOME

SAFETY NETTING

Delayed Referral*

SELF Referral*

Test

Positive test in High Risk group

Risk Assessment
Onboarding to COVID
Oximetry@home

Patient Self monitoring/Escalation
Clinical 'check-in' calls

Recovery / discharge

Emergency Admission

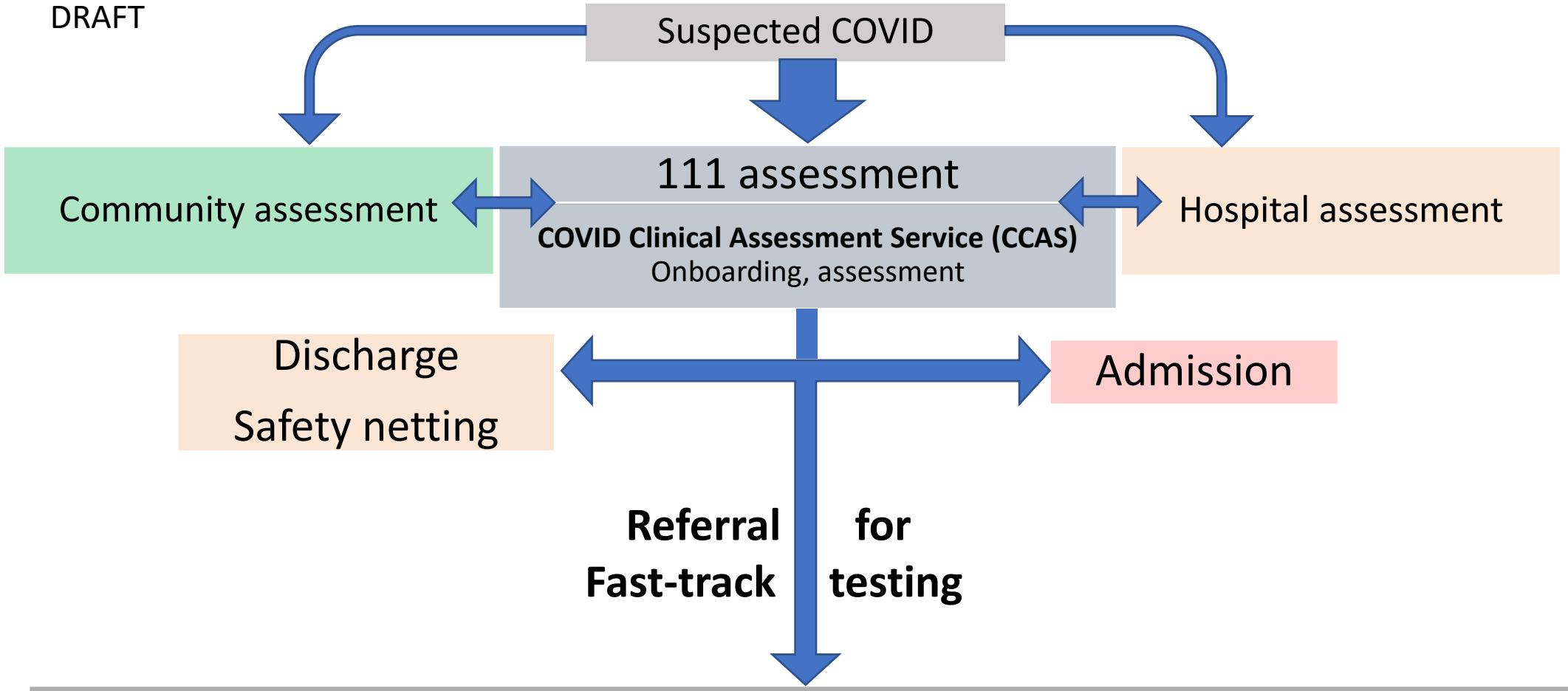
Oxygen Saturation (on air) threshold (%)	Number of observations
85	8
86	8
87	6
88	23
89	25
90	32
91	31
92	33
93	45
94	74
95	76
96	129
97	156
98	132
99	139
100	95

*We need a single, reliable and safe direct clinical referral pathway for testing, risk assessment and onboarding for CO@h/testing/future treatments.

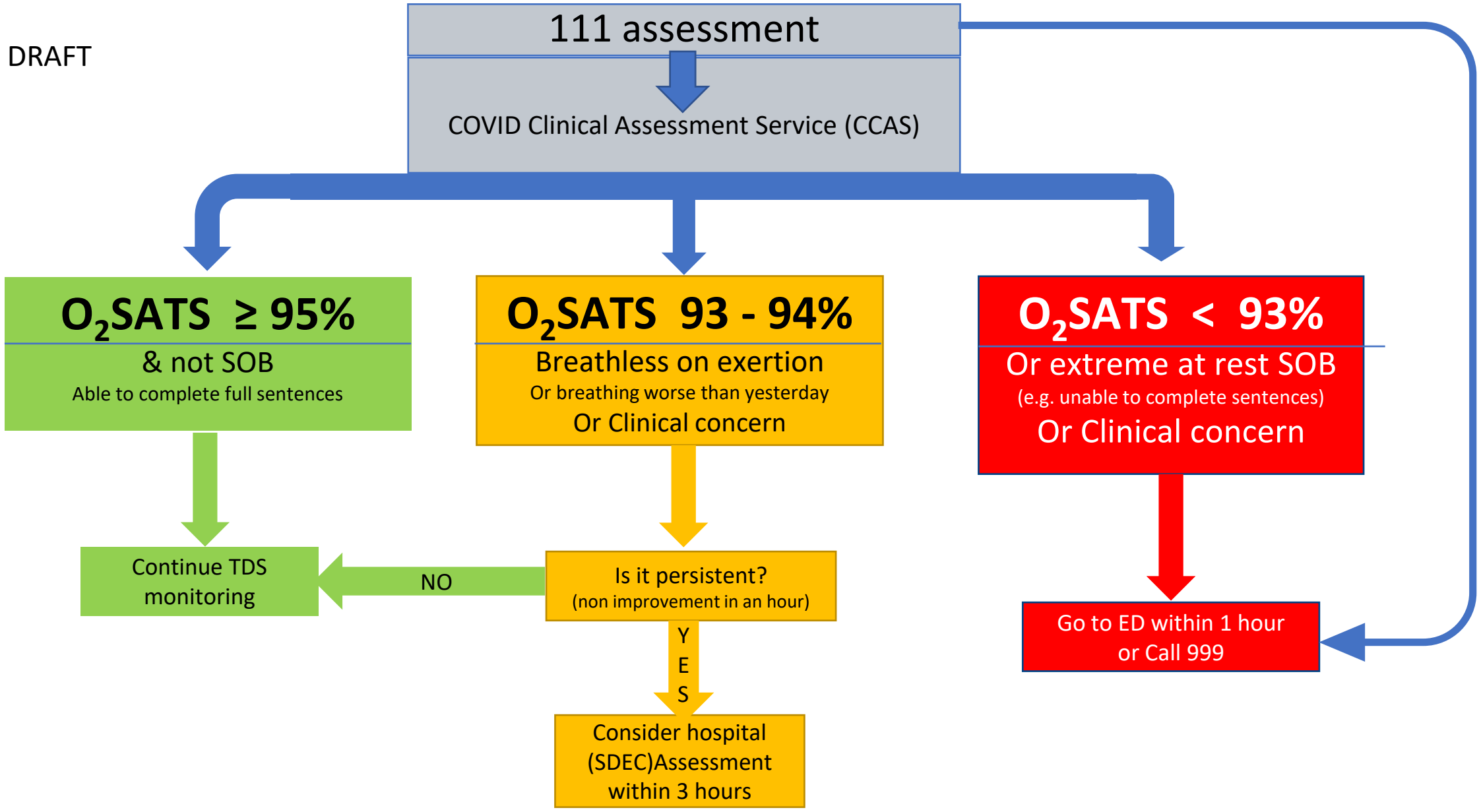
Tests are not ordered by clinicians at the referring end; leading to concerns over the systems reliability.
Non conveyed urgent care COVID patients need a direct referral system from the roadside to give reassurance over rapid follow up and assure clinicians that patients will be reliably and quickly onboarded
Without this, potentially more patients will be conveyed and admitted than is necessary.
<- Data from first peak showed that 2/3rd of ambulance conveyed and admitted patients had normal oxygen saturations (95-100%)

Appendices

COVID Oximetry @home 24/7 single point of access via 111/CCAS



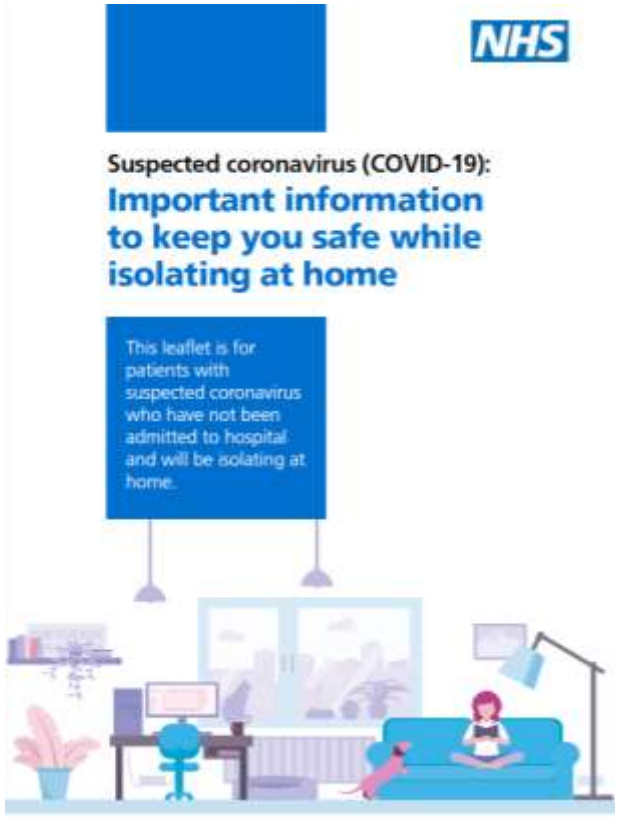
24/7 COVID Oximetry @home DETERIORATION pathway via 111 CCAS

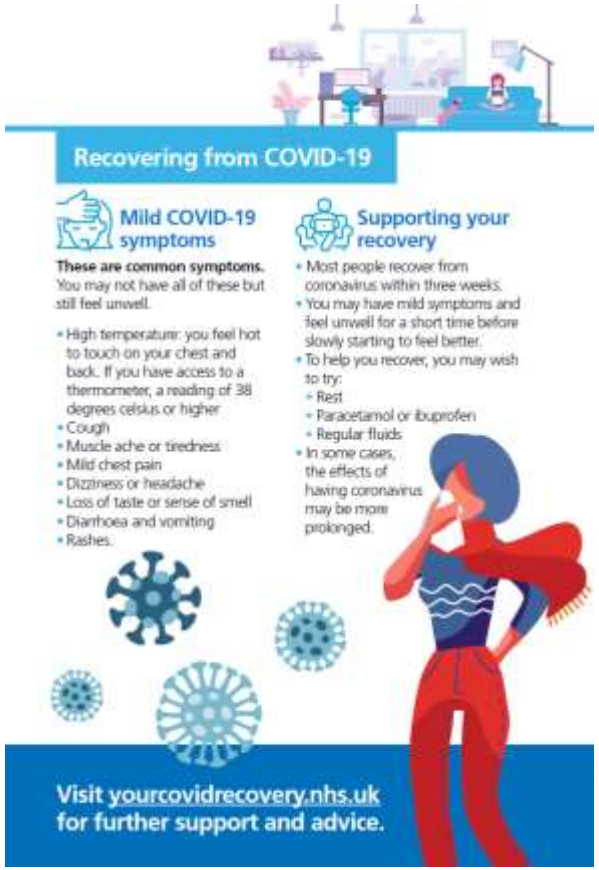


Complete Safety netting awaiting sign off
And then urgent multilingual translation

Consistent with already published NHS England Public facing COVID diary resources

https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/06/C0445-Remote-monitoring-in-primary-care-Annex-2-diary.pdf





Infectious diseases
Original research

Retrospective cohort study of admission timing and mortality following COVID-19 infection in England

Ahmed Alaa[1], Zhaozhi Qian[2], Jem Rashbass[3], Jonathan Benger[3], Mihaela van der Schaar[2]

Author affiliations +

Abstract

Objectives We investigated whether the timing of hospital admission is associated with the risk of mortality for patients with COVID-19 in England, and the factors associated with a longer interval between symptom onset and hospital admission.

Design Retrospective observational cohort study of data collected by the COVID-19 Hospitalisation in England Surveillance System (CHESS). Data were analysed using multivariate regression analysis.

Setting Acute hospital trusts in England that submit data to CHESS routinely.

Participants Of 14 150 patients included in CHESS until 13 May 2020, 401 lacked a confirmed diagnosis of COVID-19 and 7666 lacked a recorded date of symptom onset. This left 6083 individuals, of whom 15 were excluded because the time between symptom onset and hospital admission exceeded 3 months. The study cohort therefore comprised 6068 unique individuals.

Main outcome measures All-cause mortality during the study period.

Results Timing of hospital admission was an independent predictor of mortality following adjustment for age, sex, comorbidities, ethnicity and obesity. Each additional day between symptom onset and hospital admission was associated with a 1% increase in mortality risk (HR 1.01; $p<0.005$). Healthcare workers were most likely to have an increased interval between symptom onset and hospital admission, as were people from Black, Asian and minority ethnic (BAME) backgrounds, and patients with obesity.

Conclusion The timing of hospital admission is associated with mortality in patients with COVID-19. Healthcare workers and individuals from a BAME background are at greater risk of later admission, which may contribute to reports of poorer outcomes in these groups. Strategies to identify and admit patients with high-risk and those showing signs of deterioration in a timely way may reduce the consequent mortality from COVID-19, and should be explored.

U65 and mortality/ICU by oxygen sats

sats%	patient numbers	Died in 30	Died in 5	Crit care 30	Composite mortality or critical care	30 day mortality rate	5 day mortality rate	crit care 30 rate	Composite mortality or crit care rate
100	51	0	0	2	2	0.00%	0.00%	3.92%	3.92%
99	66	0	0	0	0	0.00%	0.00%	0.00%	0.00%
98	55	0	0	2	2	0.00%	0.00%	3.64%	3.64%
97	60	0	0	1	1	0.00%	0.00%	1.67%	1.67%
96	46	0	0	3	3	0.00%	0.00%	6.52%	6.52%
95	24	0	0	1	1	0.00%	0.00%	4.17%	4.17%
94	19	0	0	3	3	0.00%	0.00%	15.79%	15.79%
93	12	0	0	1	1	0.00%	0.00%	8.33%	8.33%
92	11	2	1	4	5	18.18%	9.09%	36.36%	45.45%
91	8	2	0	3	4	25.00%	0.00%	37.50%	50.00%
90	15	1	1	3	4	6.67%	6.67%	20.00%	26.67%
89	4	0	0	2	2	0.00%	0.00%	50.00%	50.00%
88	6	1	0	2	2	16.67%	0.00%	33.33%	33.33%
87	1	0	0	0	0	0.00%	0.00%	0.00%	0.00%
86	1	1	1	1	1	100.00%	100.00%	100.00%	100.00%
85	5	1	0	3	4	20.00%	0.00%	60.00%	80.00%
<85	33	5	0	14	15	15.15%	0.00%	42.42%	45.45%

65 or above mortality/ICU by oxygen sats

Should ambulances leave
An oximeter pack with non conveyed
High risk patients?

sats%	patient numbers	Died in 30	Died in 5	Crit care 30	Composite mortality or critical care	30 day mortality rate	5 day mortality rate	crit care 30 rate	Composite mortality or crit care rate
100	51	8	3	1	8	15.69%	5.88%	1.96%	15.69%
99	84	7	3	1	8	8.33%	3.57%	1.19%	9.52%
98	89	9	2	3	11	10.11%	2.25%	3.37%	12.36%
97	103	8	0	1	9	7.77%	0.00%	0.97%	8.74%
96	88	6	2	5	10	6.82%	2.27%	5.68%	11.36%
95	61	9	3	0	9	14.75%	4.92%	0.00%	14.75%
94	67	12	1	0	12	17.91%	1.49%	0.00%	17.91%
93	36	6	2	0	6	16.67%	5.56%	0.00%	16.67%
92	28	7	2	1	8	25.00%	7.14%	3.57%	28.57%
91	28	6	0	1	7	21.43%	0.00%	3.57%	25.00%
90	25	10	5	0	10	40.00%	20.00%	0.00%	40.00%
89	24	6	1	0	6	25.00%	4.17%	0.00%	25.00%
88	22	6	3	1	6	27.27%	13.64%	4.55%	27.27%
87	6	1	1	0	1	16.67%	16.67%	0.00%	16.67%
86	8	2	2	1	3	25.00%	25.00%	12.50%	37.50%
85	4	4	3	0	4	100.00%	75.00%	0.00%	100.00%
<85	71	30	23	5	33	42.25%	32.39%	7.04%	46.48%

Oxygen Saturation (on air) threshold (%)	Sensitivity (95 % CI)	Specificity (95 % CI)	Number of observations	Cumulative sum of number of observations
85	0.287 (0.240-0.334)	0.958 (0.952-0.964)	8	76
86	0.312 (0.269-0.356)	0.953 (0.947-0.958)	8	84
87	0.312 (0.269-0.356)	0.947 (0.938-0.955)	6	90
88	0.353 (0.314-0.393)	0.928 (0.915-0.941)	23	113
89	0.392 (0.354-0.431)	0.907 (0.893-0.912)	25	138
90	0.481 (0.445-0.516)	0.885 (0.870-0.899)	32	170
91	0.553 (0.510-0.597)	0.862 (0.845-0.879)	31	201
92	0.624 (0.584-0.664)	0.836 (0.818-0.854)	33	234
93	0.664 (0.633-0.695)	0.795 (0.777-0.812)	45	279
94	0.713 (0.686-0.739)	0.723 (0.705-0.742)	74	353
95	0.760 (0.724-0.796)	0.650 (0.648-0.662)	76	429
96	0.841 (0.807-0.875)	0.526 (0.513-0.538)	129	558
97	0.880 (0.857-0.904)	0.368 (0.355-0.380)	156	714
98	0.921 (0.901-0.940)	0.235 (0.255-0.245)	132	846
99	0.96 (0.942-0.977)	0.094 (0.085-0.104)	139	985
100	1	0	95	1080

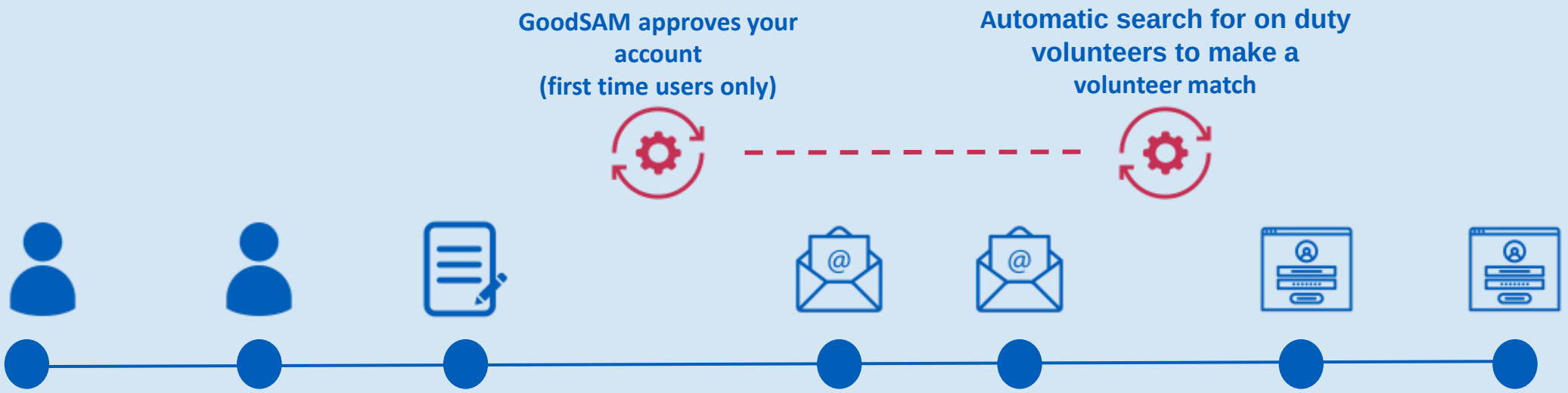
Table 2: Evaluation of initial oxygen saturation measured by paramedics in COVID-19 patients in the community used as a binary classifier for predicting 30-day mortality or ICU admission. Each row denotes a different threshold for determining those at risk of death. We display the sensitivity and specificity for each threshold, equivalent to all possible intersections of the receiving operator curve using thresholds between 85 % and 100 %. In total 68 patients had an oxygen saturation of 84 % or less (not shown). The column on the far right denotes the cumulative sum of the number of observations of the given oxygen saturation (row) or below. For example, 76 patients had an oxygen saturation of 85 % or less recorded (top row) and 429 patients had an oxygen saturation of 95 % or less recorded.

NHS Volunteer Responders referral process

Process for requesting an NHS Volunteer Responder for a task

Referrers

- Health and social care practitioners
- Pharmacists
- Local authorities
- VCSE organisations



To refer a patient, visit goodsamapp.org/NHSreferral or call 0808 196 3382

Classification: Official

Publications approval reference: 001559

To: CCG AOs, CCG Chairs, Community Provider CEOs

Copy: ICS CEOs, Acute Provider CEOs and Medical Directors, 111 and Ambulance CEOs, AHSN MDs, PCN Clinical Directors

12 November 2020

Dear Colleagues

ESTABLISHMENT OF COVID OXIMETRY @HOME

As treatment of COVID improves, earlier detection of (silent) hypoxia at home could help further reduce mortality and morbidity.

Following successful testing in various parts of the NHS, we are now recommending that CCGs put in place a COVID Oximetry @home model during November, as part of the ongoing response to the pandemic.

Sometimes called a COVID 'virtual ward', the recommended model is based on patient self-monitoring. Designed for adoption at scale, the Standard Operating Procedure draws from learning to date and from pilots completed over the summer and early autumn.

What is the model?

As patients present at NHS services with COVID-19, defined cohorts are offered an NHS oximeter, for their own self-monitoring, three times a day, for up to a fortnight.

They are given advice: go to hospital or call 999 if their oxygen level is 92% or lower, or call your GP surgery or 111 if it's 94% or 93%.

Through a shared decision-making conversation, they are also given the option of a regular prompt at days 2, 5, 7,10 and 12, either by (a) text message or (b) by e-mail; or instead (c) a non-clinician led phone call.

The work to date suggests patients on this pathway are well motivated to self-monitor effectively for the short period involved.

Typically, a friend or family member, or an NHS Volunteer Responder, can collect and then return the oximeter for decontamination and reuse.

Who are the defined cohorts?

Existing evidence suggests the cohorts that will benefit most are those with:

1. A diagnosis of COVID-19: either clinically, or positive test result **and are also**
2. Symptomatic **and are either**
    a. *Aged 65 years or older* **or**
    b. *Under 65 years and clinically extremely vulnerable to COVID.*[1]

Colleagues are advised to consider carefully the implications before extending the pathway more widely.

How is it implemented?

As an out-of-hospital based model, we are asking CCGs to take the lead responsibility for implementation, drawing on the Standard Operating Procedure.

The default assumption is that the model is primarily implemented in general practice, e.g. including in hot hubs, working with community teams. £150 million of additional funding for General Practice to increase capacity between now and March has been allocated to CCGs this week. This fund can be used for General Practice-specific costs of COVID Oximetry@home. CCGs will separately need to provide clinical leadership and any other necessary additional support. Referrals of the defined cohorts will also come via 111 Covid Clinical Assessment Service (CCAS), Test and Trace and hospital Emergency Departments.

Local systems will need to ensure reliable arrangements are in place for same day oximeter distribution to patients, and their subsequent decontamination and reuse. A supply of pulse oximeters is available to CCGs. If local systems wish to extend the service beyond the above defined cohort, they will need to resource this locally, including provision of additional oximeters.

Practical guidance is available including a national learning network, implementation support from local Academic Health Science Networks (AHSNs), infection prevention and control and patient leaflets in a range of languages (see here for further details). NHSX will also be supporting a selection of sites across the country with implementing and evaluating the costs and benefits of additional technology.

SNOMED codes specific to home monitoring of COVID-19 patients do not yet exist. We therefore encourage primary care and community teams to use existing remote monitoring codes. NHS Digital will advise which codes to use for each stage of the monitoring, and a new data set will be implemented to support this initiative.

[1] The Clinically Extremely Vulnerable (CEV) to COVID list should be used as the primary guide. Clinical judgement can apply and take into account multiple additional COVID risk factors. The CEV list continues to be updated in the light of the latest evidence.

Who is this for ?

Diagnosis of COVID-19: either clinically or positive test result **AND**

Symptomatic AND EITHER

1. ***Aged 65 years or older*** **OR**

2. ***Under* 65 *years and clinically extremely vulnerable to COVID***.
   (The Clinically Extremely Vulnerable to COVID list should be used as the primary guide. Clinical judgement can apply and take into account multiple additional COVID risk factors; for the most part, we anticipate this will already have led to inclusion on the CEV list.)

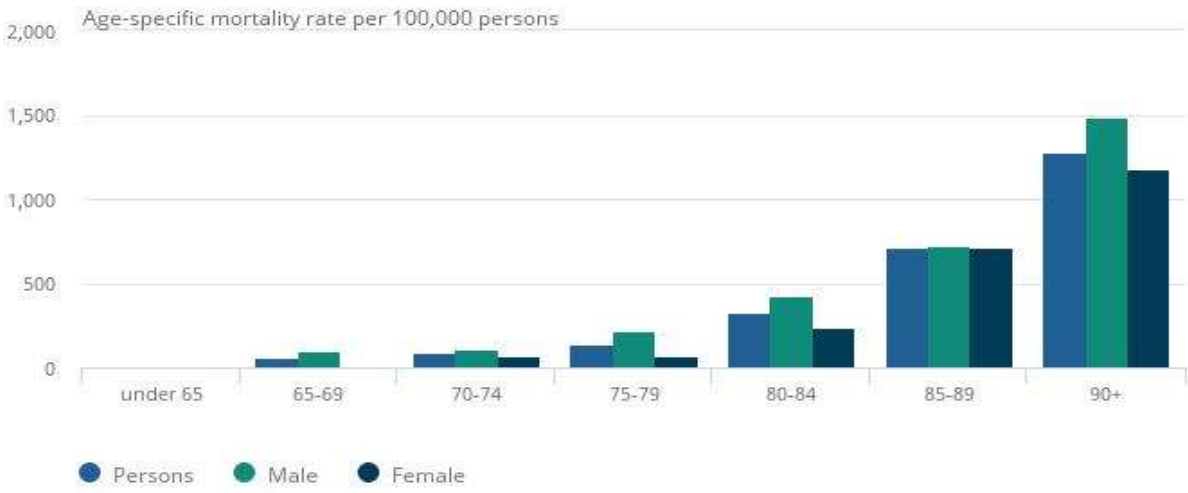
[Note we are finalising the precise wording of this second group: there is a real and significant risk that far too many people are entered into the scheme]

Clinical judgement should be used outside of these parameters but for limited groups and only those who have major risk factors for a poor outcome or late presentation. Considerations could include:

- Members of a minority ethnic group
- Obesity (BMI >35)
- Patients with significant comorbidities (eg active cancer treatment, significant immunosuppression, diabetes/chronic lung disease)
- LeD/Severe Mental health

Figure 6: Across all age groups in Wales, males had a higher rate of COVID-19 deaths than females

Age-specific mortality rates due to COVID-19, per 100,000 persons, Wales, deaths occurring in June 2020



Source: Office for National Statistics – Deaths involving COVID-19

What to do if your oxygen saturation is not normally 95-100%

SEVERE

O_2 92%* or lower

Or any of RR ≥ 25, HR ≥ 131, new confusion

≈ NEWS2 ≥ 5

*Or if O2 sats >4% less than usual

CONSIDER URGENT ADMISSION

MODERATE

O_2 93 - 94%*

Or any of RR 21-24, HR 91-130

≈ NEWS2 3-4

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

CONSIDER Hospital ADMISSION / ASSESSMENT

MILD

O_2 95% or higher

Or any of RR ≤ 20, HR ≤ 90

≈ NEWS2 0-2

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

CONSIDER MONITORING