



Royal College of
General Practitioners

RCGP paper on Virtual Wards, Silent Hypoxia and improving COVID outcomes

October 2020

Introduction

COVID-19 remains a significant threat to the individual and society. We now know much more about how this disease progresses and what can be done to influence the course of the disease. It has also been recognised that a proportion of patients presented to hospital significantly hypoxic without perceiving themselves to be overly unwell or breathless, so called Silent Hypoxia⁽²⁾. This late presentation leads to them requiring intensive therapies and often poor outcomes. It has been suggested that identifying such patients at an earlier phase in their illness when they are starting to become hypoxic will give opportunities for therapies to be instituted earlier with fewer needing escalation of care to intensive care and ventilation⁽³⁾.

The reasons for this late presentation are multi-factorial and not well studied. Experienced clinicians with the disease have reported not feeling unduly breathless despite deteriorating physiology. Patients presenting to hospital must leave loved ones and feared poor outcomes if they are admitted in early days of COVID-19 with only supportive therapies available. If we are to maximise the usefulness of emerging therapies, we also need to address these perceptions and ensure that those who are deteriorating are supported to recognise and act on that deterioration.

NHS England is currently piloting a virtual ward concept aimed at encouraging COVID-19 positive patients to monitor their own oxygen saturations using loaned oximeters and report it to a central monitoring service. Similarly, individual practices or health systems have been undertaking this for themselves to benefit patients. Patients are advised and supported as to when they should call for additional advice or seek urgent help based on their oximetry levels.

This paper sets out the known evidence for this concept and the role of GPs in delivering and supporting this.

Current Knowledge

Patients who become significantly unwell with COVID have several days~6-11 where their condition follows a non-specific pathway followed by sudden and occasionally catastrophic deterioration^(4, 5).

Silent hypoxia is a recognised feature of the presentation of patients to hospital with severe COVID⁽⁶⁾

A GP's personal experience

21st Unwell with cough & fever O₂ Sat 97%
23rd Taste lost O₂ Sat 95-4% NEWS=1-2
28th Increased cough increased resp. rate NEWS =5
30th Started clarithromycin
1st Not well but reluctant to consider other options
Resp. rate 28, O₂ Sat 90% Temp 38.1 NEWS=7
1st Admitted with oximetry on arrival at 89%
Desaturated to 83% on 40 step walk test

Classical COVID Appearance on x-ray, swabs positive
treated with oxygen, broad spectrum antibiotics and heparin

Gradual reduction in oxygen demands over 5 days with
discharge on Day 5

"It was only my worsening physiology that made my family
convince me to go to hospital, not my own judgement. I am
so glad I did"

There are a range of therapies which if given to patients with severe COVID-19 seem to reduce the severity of the disease

- Oxygen^(7, 8)
- Steroids⁽⁹⁻¹²⁾
- Remdesivir^(13, 14)

We also know that compared to other countries the UK thresholds for Oxygen initiation were amongst the lowest and that this had a negative association with national case fatality rates⁽⁸⁾

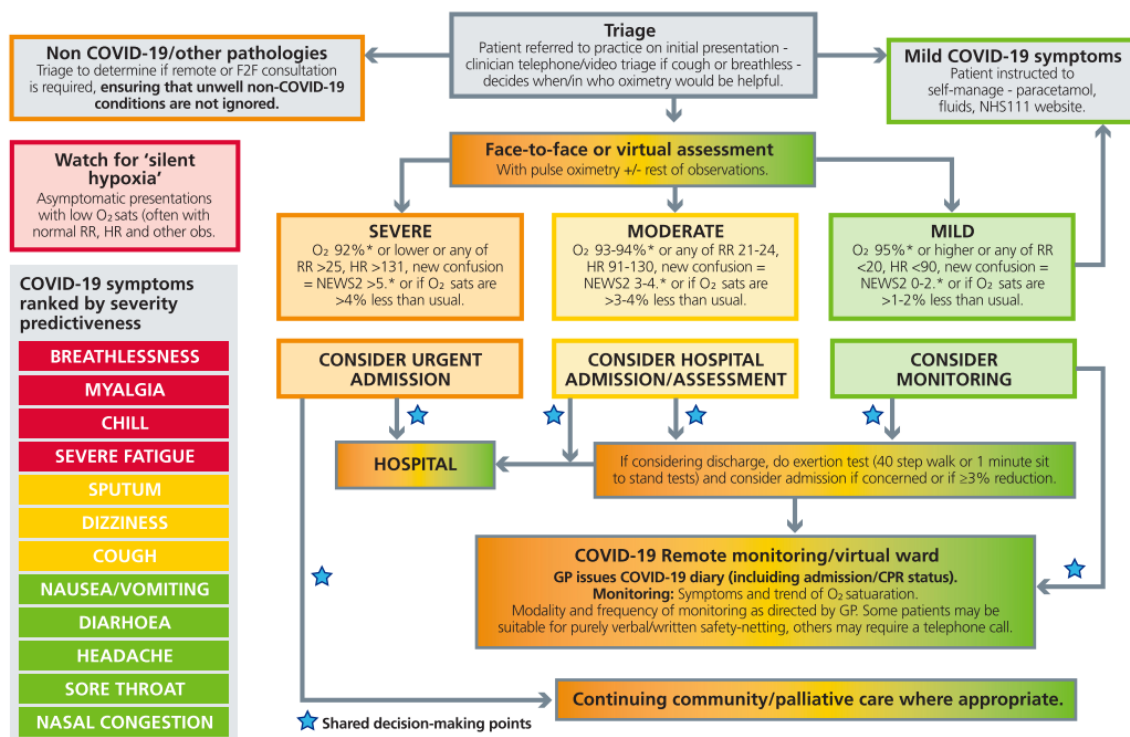
Many others are being studied including convalescent plasma and azithromycin.

Concept⁽¹⁵⁾

The NHS England pilot sites have developed systems both primary and secondary care led that aim to loan people in the early stages with simple oximeters to be able to measure their own oximetry for two weeks. These vary in size and organization.


Tees Valley COVIDCare@HOME model

Patients are invited to join a Virtual “Ward” loaned an oximeter and invited to submit oximetry readings twice a day, ideally using an app, which aids data collection and instructs patients as to what they need to do if their oxygen saturations fall. The ward is run by the local GP Federations with the active support of the CCG and secondary care colleagues.



⁷See also: <https://www.cebm.net/covid-19/what-is-the-efficacy-and-safety-of-rapid-exercise-tests-for-exertional-desaturation-in-covid-19/>

The ward is monitored by primary care nurses remotely, who support patients who are on the ward, encouraging and facilitating reporting and action if that is required. Together with



administrative staff they facilitate access for those who might struggle to use the App. At the end of 14 days the patient's ongoing needs can be assessed and the oximeter returned for re-use.

GP Level Home Oximetry solutions

In some locations a geography wide model may not be appropriate or possible and smaller scale approaches have been adopted.

Case 1

During the height of the pandemic, a GP surgery in London, after assessing patients in the usual way by phone, video or face to face, provided patients with pulse oximeters to monitor their own saturations. These were collected from the surgery by relatives/ neighbours not exposed to the disease or delivered and posted through patients' doors if there was no one who could collect it on their behalf. Patients were instructed that if the number fell below 92% (with previously normal saturations) to see urgent and immediate help. A printed paper protocol was given to the patient explaining when to seek less urgent help. The GP surgery followed the patients up with phone calls on a clinically determined protocol until they were considered to have recovered from COVID-19, or until they were admitted to hospital.

Case 2

A GP surgery in Derbyshire with a high proportion of health care staff as patients monitored patients who self-reported concerning symptoms of COVID-19 remotely. The patients had their own pulse oximeter either purchased themselves due to concerns about COVID-19 or loaned via their place of work. Virtual (telephone and video) consultations were held to initially assess the patient, escalating to face to face assessment for those required it. Once deemed clinically safe to stay in the community, if they had their own pulse oximeter, patients were asked to self-monitor on a regular basis and report to the GP surgery, 111 or A&E if their saturations dropped below a clinically determined level depending on their baseline levels. Patients reported increased confidence in remote consultations and less anxiety about when to present for further assessment.

The model used to achieve this will vary depending upon that local geography and capacity, from individual practices to whole areas. Some patients may be able to access their own medical grade oximeters and others will need to receive loan devices. Capacity of these wards may require that devices are loaned to those deemed most at risk of acute deterioration from COVID-19. Patients who are chronically hypoxic due to pre-existing disease or for whom escalation to hospital care would be undesirable will need to receive additional care and support to determine their ongoing care needs and would generally not be suitable to this model of care and may require more bespoke approaches. The work of these pilots is being assessed to judge if should be rolled out across England.

At the time of writing it is not clear whether similar approaches are being used across the devolved nations.

Discussion

The outcomes from the pilot sites continues to be assessed and with initially low volumes of disease and patients being recruited it may not be possible to determine the positive and negative aspects of this approach with enough clarity before the expected pressure of Winter and any second wave arrive.

The anticipated benefits of these pilots include earlier presentation of severe disease with shorter hospital admissions and potentially reduced mortality. This is likely to be due trends in deterioration being identified more clearly and patients being encouraged and facilitated to overcome their reticence to seek further help and assessment.

There are possible risks too, whilst potentially reducing the number requiring ITU facilities the numbers of patients needed to treat to prevent with lower level interventions to prevent an ITU admission is not. We do know who formed the higher risk categories for deterioration and death but some patients in the community who would have recovered without intervention may be subject to admission and treatments.


It is clear that resources both physical and human will be tight whichever way the decision is made but for patients is it better to support them to make a decision with an oximeter or to let them make their own decision? Is it better for clinicians to make decisions based upon a documented trend of deterioration or to make a call when presented with a single set of observations? Do patients appreciate being supported in this way? Will those that can afford to buy their own oximeters anyway?

Practices in England are already being asked to consider supporting remote monitoring⁽¹⁾ though what that support consists of is unclear. Early in the pandemic, some individual practices and areas offered mobile one off physiological measurement services, virtual wards build upon that concept to provide care

throughout the period of being unwell. Mobilising virtual wards takes time, resource and leadership which is an even bigger challenge as pressure in health care systems and demands on General Practice increase. Individual GP practices may struggle to coordinate, deliver, and sustain this unsupported and that above practice organisation and delivery in some form is likely to be required if whole geographies are to be cared for in this way. Areas with increasing prevalence of COVID-19 (Leicester and Greater Manchester) are setting up virtual wards at speed which may aid the research outcomes validity. If the evidence is unclear or uncertain, a problem familiar to general practice, should we roll these out and prepare ourselves now or wait to see if as Winter approaches we learn more and can implement wards when prevalence suddenly increases? Importantly irrespective of the uncertain science it gives primary care an opportunity to offer support and care for patients who have a difficult to assess and frightening disease. If it is decided that the virtual ward approach is to be expanded it is vital that its risks and benefit and value both economic and for the individual continue to be assessed beyond the pilot phase.

“Practices should consider how they could work together to support remote monitoring of patients with symptoms of COVID-19; this work may need to be stepped up in response to increases in local prevalence of COVID-19”

Figure 1NHS Standard Operating Procedure⁽¹⁾




The wards clearly need to be able to address all accessibility issues including deprivation, language and disability. Where digital technology (Apps) are used to improve capacity and staffing requirements, alternative approaches that provide accessibility for all must be developed simultaneously.

The lessons of Emergency Planning and Business Continuity suggest that preparation is never wasted and for this reason College would support any decision to prepare ahead of need and that developing a capacity to deliver oximetry monitoring in the community would seem justified on the science as it is understood now. The college recognises that developing such services, provides care alongside the science for patients who can find it very difficult to assess the need for further clinical assessment of their disease and are reluctant to approach healthcare for assistance. Evaluation must continue to be part of that preparation and delivery, but we may not have the luxury of time to wait until all the results are in before it is time to act. A dilemma all GPs know well. As a consequence the RCGP supports the further development of access to home oximetry services and virtual wards for patients with COVID-19 at this time, but notes that this must be accompanied by quantitative and qualitative research so that benefits and downsides to this approach are learned

Dr Simon N Stockley
18th October 2020

References

1. NHS England. Guidance and standard operating procedures General practice in the context of coronavirus (COVID-19). In: NHS England. 2020. https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/CO485_guidance-and-standard-operating-procedures-general-practice-covid-19.pdf
2. Wilkerson RG, Adler JD, Shah NG, Brown R. Silent hypoxia: A harbinger of clinical deterioration in patients with COVID-19. *The American journal of emergency medicine*. 2020:S0735-6757(20)30390-9.
3. Goyal DK, Mansab F, Iqbal A, Bhatti S. Early intervention likely improves mortality in COVID-19 infection. *Clinical Medicine*. 2020;20(3):248-50.
4. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*. 2020;395(10229):1054-62.
5. Xu XW, Wu XX, Jiang XG, Xu KJ, Ying LJ, Ma CL, et al. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. *BMJ (Clinical research ed)*. 2020;368:m606.
6. Jouffroy R, Jost D, Prunet B. Prehospital pulse oximetry: a red flag for early detection of silent hypoxemia in COVID-19 patients. *Critical Care*. 2020;24(1):313.
7. Ferreyro BL, Angriman F, Munshi L, Del Sorbo L, Ferguson ND, Rochweg B, et al. Association of Noninvasive Oxygenation Strategies With All-Cause Mortality in Adults With Acute Hypoxemic Respiratory Failure: A Systematic Review and Meta-analysis. *Jama*. 2020.
8. Goyal D. Oxygen and mortality in COVID-19 pneumonia: a comparative analysis of supplemental oxygen policies and health outcomes across 26 countries. *medRxiv*. 2020:2020.07.03.20145763.
9. WHO. Corticosteroids for COVID-19. In: World Health Organisation. World Health Organisation,; 2020. <https://www.who.int/publications/i/item/WHO-2019-nCoV-Corticosteroids-2020.1>
10. Investigators TWCftR-C. Effect of Hydrocortisone on Mortality and Organ Support in Patients With Severe COVID-19: The REMAP-CAP COVID-19 Corticosteroid Domain Randomized Clinical Trial. *Jama*. 2020.
11. Group TWREAfC-TW. Association Between Administration of Systemic Corticosteroids and Mortality Among Critically Ill Patients With COVID-19: A Meta-analysis. *Jama*. 2020.

- 
12. Horby P, Lim WS, Emberson J, Mafham M, Bell J, Linsell L, et al. Effect of Dexamethasone in Hospitalized Patients with COVID-19: Preliminary Report. medRxiv. 2020:2020.06.22.20137273.
 13. Ferner R E, Aronson J K. Drug vignettes: Remdesivir Oxford: The Centre for Evidence-Based Medicine; 2020. Available from: <https://www.cebm.net/covid-19/drug-vignettes-remdesivir/>.
 14. Spinner CD, Gottlieb RL, Criner GJ, Arribas Lopez JR, Cattelan AM, Soriano Viladomiu A, et al. Effect of Remdesivir vs Standard Care on Clinical Status at 11 Days in Patients With Moderate COVID-19: A Randomized Clinical Trial. Jama. 2020.
 15. Pulse oximetry to detect early deterioration of patients with COVID-19 in primary and community care settings. In: NHS England. 2020.^<https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/06/C0445-remote-monitoring-in-primary-care.pdf>