Virtual Wards
Learning from Covid....
Improving Respiratory Care

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Cheshire & Merseyside
Population 2.5 million

World class expertise from the UK’s largest heart & chest hospital
Rapid research to ascertain outcomes for symptomatic patients at home
- Linked data from patients recording oxygen levels, age and outcomes.
- Monitoring the trends of symptoms & oxygen saturations predicts who of these are likely to do badly

In England, community oxygen saturations of 92% or less is the cut off for when death or intensive care becomes much more likely (at all ages)

5 day mortality (N= 1,212)

- 95-100%: 1.67%
- 93-94%: 2.24%
- < 93%: 14.33%

30 day mortality (N= 1,212)

- 95-100%: 6.04%
- 93-94%: 13.43%
- < 93%: 28.33%

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

OXYGEN SATURATION ADVICE

If you continue to record these blood oxygen levels seek help:

- 100
- 99
- 98
- 97
- 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

Leading to National policy change and mandate

NHS England COVID Safety netting guidance

617/1080 COVID admissions had Sats 95-100%
Patient reassurance & partnership is key

<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 |

[Crosstab table]

<table>
<thead>
<tr>
<th>Days since first symptoms</th>
<th>Date</th>
<th>Pulse</th>
<th>Oxygen Level %</th>
<th>Temp °C</th>
<th>Are you feeling</th>
<th>Is your breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Better</td>
<td>Better</td>
</tr>
</tbody>
</table>

VIRTUAL WARD
Home self monitoring with Telephone service +/- app
Supporting early discharge to maintain hospital capacity
Hospital Clinical Assessment / Discharge guidance

**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*

93-94%

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

**ADMISSION**
Consider discharge if Clinically stable Within 24-48 hours

**CONSIDER DISCHARGE**
Lower acuity
Lower clinical concern
Home Patient Self monitoring Covid Oximetry@Home

Higher acuity
Higher clinical concern

Concerning symptoms**
- SHORTNESS OF BREATH
- Chills/rigors
- Severe myalgia/fatigue
- Collapse/Confusion

Clinician supervised VIRTUAL WARD
Telephone service +/- app
Supporting early discharge to maintain hospital capacity
If resources allow

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<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sats ≥ 95% and &lt; 3% desaturation on exertion</td>
<td>Sats 93-94% with &lt; 3% desaturation on exertion OR ≥ 95% with ≥ 3% desaturation on exertion</td>
<td>Sats 92% or less OR 93-94% with ≥ 3% desaturation on exertion</td>
</tr>
</tbody>
</table>

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 its still 92% or below go to hospital immediately

CXR, bloods
Additional risk factors, clinical concern** or NEWS2 ≥ 3

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

Concerning symptoms**
- SHORTNESS OF BREATH
- Chills/rigors
- Severe myalgia/fatigue
- Collapse/Confusion

Clinician supervised VIRTUAL WARD
Telephone service +/- app
Supporting early discharge to maintain hospital capacity
If resources allow
**IMPACT**

A. Reduced length of stay in admissions
B. Reduced overall mortality rates
C. Safe model of care
D. Increased virtual care leads to reduced admissions
<table>
<thead>
<tr>
<th></th>
<th>COVID Oximetry @home</th>
<th>COVID virtual ward</th>
</tr>
</thead>
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<tr>
<td><strong>WHERE</strong></td>
<td>Primary care supervised</td>
<td>Hospital supervised</td>
</tr>
<tr>
<td><strong>WHO</strong></td>
<td>Lower acuity/complexity</td>
<td>Higher acuity/complexity</td>
</tr>
<tr>
<td><strong>WHEN</strong></td>
<td>Community diagnosed patients</td>
<td>Emergency hospital patients</td>
</tr>
<tr>
<td><strong>AIMS</strong></td>
<td>Safe admission avoidance and self escalation</td>
<td>Early supported hospital discharge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>safe admission avoidance</td>
</tr>
<tr>
<td><strong>HOW</strong></td>
<td>Patient self monitoring/escalation</td>
<td>Monitored service</td>
</tr>
<tr>
<td></td>
<td>Earlier deterioration presentation</td>
<td>Reliable deterioration recognition</td>
</tr>
<tr>
<td><strong>WHAT</strong></td>
<td>Supportive treatments</td>
<td>+/- Dexamethasone, LMWH, O2</td>
</tr>
</tbody>
</table>
COVID Oximetry Implementation across England

Training COVID-19 patients to self monitor/escalate
• Early identification of deterioration
• Admission avoidance
• Early safe discharge

Jan 2021
60%

Feb 2021
100%

Dec 2020
35%

IMPROVEMENT STRATEGY across 5-10 million population regions
EARLY SUPPORTED HOSPITAL DISCHARGE for ADULTS WITH COVID

SEVERE

O₂ 92% or lower
*Or if O₂ sats >4% less

Mod/severe Shortness of breath
Severe fatigue/muscle aches
Confusion

SEVERE - UNSUITABLE FOR COVID VIRTUAL WARD OR OXIMETRY @HOME

MODERATE

O₂ 93 - 94%
*Or if O₂ sats 3-4% less than usual

Mild Shortness of breath

CONSIDER EARLY SUPPORTED HOSPITAL DISCHARGE

Exertion test (40 step walk or 1 min sit-to-stand tests)
AND SENIOR REVIEW if ≥ 3% reduction.

MILD

O₂ 95% or higher
*Or if O₂ sats are 1-2% less than usual

must be able to undertake activities of daily living

DEXAMETHASONE, ANTICOAGUATION +/- Oxygen
PULSE OXIMETER & training
SAFETY NETTING
DIARISING AND MONITORING VIA COVID VIRTUAL WARD (MODERATE) OR COVID OXIMETRY @HOME (MILD)
Early supported discharge guidance for adults with confirmed or suspected COVID

1. Nurse led identification of patients potentially suitable for early supported ward DISCHARGE

- Improving clinical trajectory (symptoms, function, oxygen saturations)
- No fever for 48h consecutively without medication to reduce fever
- If NEWS Score stable (0-4):
  - Oxygen saturations (sats) 95% or higher (nurse initiated discharge)
  - Oxygen saturations (sats) < 95% or higher (clinician led discharge)

2. Clinician review to authorize discharge

- As above + Blood tests improving, consider follow up in the COVID virtual ward on discharge*
- Discharge may be considered in stable patients when Oxygen sats <93% if baseline / expected baseline sats are below this range or NEWS 0-4 but stable > 48 hr
- Discharge can be considered in stable patients with mild exercise desaturation who have been fully investigated
- Any patient being considered for oxygen therapy on discharge must be discussed with the home oxygen team

3. Ward discharge check list

**Check:**
- Patient contact details
- Patient given advice to *isolate at home* until recovered i.e. at least 14 days from their first positive SARS-CoV-2 PCR test

**Patient given:**
- Copy of Discharge summary
- Follow up information
- Patient information leaflet
- Advice to contact their COVID Virtual ward monitoring service (8am- 8 pm) or NHS 111/999 if they deteriorate

Ensure discharge summary contains:
- Date of symptom onset
- Current SARS-CoV-2 PCR test status
- Whether patient desaturates on exertion
- RR, HR and oxygen saturations at rest
- Remote monitoring plan monitoring frequency, readmission criteria
- Remote treatment plan *e.g. Oxygen, dexamethasone, anticoagulation*
- Patient escalation criteria
- CXR follow-up plans
- AHP, social care & rehabilitation plans
- Treatment escalation/ readmission plan

4.*Consider COVID virtual ward if:

- Clinical Concern
- 65 years of age or older
- 65 years of age with moderate to severe comorbidity
- Lives alone
- Oxygen saturations not back to baseline 93-95%
- Immunosuppression
- Severe Long term condition
- Very overweight (BMI >35)
- BAME
- Learning disabilities incl. Downs, autism
- Diabetes

Adapted with thanks to NHS London
Covid Virtual Ward – Whiston Hospital

Hospital team educated about pathway

Patient identified as suitable for VW

Patient reviewed by Specialist nurse

Discharged from Hospital & onboarded to Virtual Ward

Daily calls from the team & Consultant Ward Round

Discharged

Community Review

Readmission
Covid Virtual Ward
Whiston Hospital
The first 7 weeks………..

<table>
<thead>
<tr>
<th>135 Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>67 patients</td>
</tr>
<tr>
<td>51 patients</td>
</tr>
<tr>
<td>9 patients</td>
</tr>
<tr>
<td>8 patients</td>
</tr>
</tbody>
</table>

- No oxygen or Dexamethasone
- Dexamethasone
- Oxygen
- Oxygen & Dexamethasone

| 220 treatment days |
| 205 treatment days |
| 124 treatment days |

| Minimum 67 bed days |
| 616 bed days |
Covid Virtual Ward Patient Feedback

100% of patients who responded said they understood why they were asked to monitor their oxygen saturations.

- **You felt you were fully supported by the Team**
  - Agree: 89%
  - Neither: 11%

- **You Were Happy to have been Discharged on to the Covid Virtual Ward Round instead of Remaining in Hospital?**
  - Agree: 95%
  - Neither: 5%

90% of patients felt they benefitted from being discharged with the support of CVW.

- **Would You Recommend this Service?**
  - Agree: 89%
  - Neither: 11%

- **“All NHS are amazing, they saved my life and after care is brilliant”**
- **“There's no place like home to recover”**
- **“It reassured me there was someone to talk to and ask questions if something went wrong”**
- **“Felt better being at home with the back up”**

- **“Hospitals are the crown jewels of the NHS”**

*CVW questionnaire based on sample size of 19 returned questionnaires as of 22/3/21*
Covid Virtual Ward
MerseyCare Telehealth

3,312 patients supported with CO@H & CVW across C&M with MCFT providing care for 1,722 patients supported on both CO@H & CVW

640 patients alerted amber resulting in 26 contacts with the GP. Ambulances were called 48 times for patients.

6,783 “alerts” due to clinical reasons; 67% were amber alerts and 23% were red alerts resulting in 3,177 calls to patients.

Use of centralised telehealth clinical hub enabled rapid implementation of pathways and scalability

The majority of patients being monitored by telehealth clinical hub did not need onward referral to either primary and secondary care
What did we learn about Virtual Wards?

Safe and effective
Patient selection is key to success
Reduces length of stay
Value added to a traditional ‘Early Supported Discharge’ model with Consultant oversight
Most patients have an uncomplicated recovery
Complications require specialist expertise/decision making
Can be delivered at scale using Telehealth
Wide ranging applications
COMO

1. Measurement
   - Wearable sensor
   - Fingertip Pulse Oximeter
   - GNSS

2. Cloud service
   - Repository
   - AI engine
   - Outputs:
     - Evolution of patient condition
     - Heat map and population fluxes
   - Physiological data
   - Geo-referenced data

3. Monitoring
   - User terminal
     - Evolution
     - Heat map
   - Nurse User
   - Physician User
   - Communicable diseases Services

4. Actionable feedback
   - 4a: Actionable feedback
     - evolution
     - patient recall, recommendation
   - 4b: Actionable feedback
     - Policies, recommendations

COMO: CoRonavirus remote MOntoring of outpatients with Heart Rate, Breathing Rate and Skin Temperature
Suggested models of future Virtual Ward care

**ACUTE SYNDROME PATHWAYS & VIRTUAL CARE**

Need for admission is guided by:
1. Mortality Risk
2. Investigations/Treatments
3. Function

≥ 5 → ADMIT → DISCHARGE

- Infection
- COPD/Asthma
- Heart Failure

0-2 → Hospital VIRTUAL WARD

Discharged Patient
Investigations
Treatment
Clinician supervised home care
- Instruction
- Self-monitoring
- Self-Escalation

**NEWS2 & Clinical Assessment**

Scoring system to predict mortality in all conditions

**Deterioration symptoms** *
- Limb pain, swelling, bleeding
- Faint/dizzy
- Weakness, sensory loss
- Constipation
- Chest pain, palpitations

**Infection symptoms** *
- Fever, Confusion
- RTI = Cough, Shortness of breath
- UTI = Frequency, dysuria, loin pain
- Cellulitis = Red tender skin
- Ulcer = New redness or discharge
- Abdominal pain, diarrhoea, vomiting

Community VIRTUAL CARE
Suggested models of future Virtual Ward care

The most predictive element of care home patients, is that at some point, they will deteriorate.

CARE HOMES

Acute Deterioration syndrome*

Integrated Care Assessment

Non referred

Non admitted

SDEC

Admitted

Hospital Discharge Ambulatory Care

Virtual Care (Community supervised)

- Lower acuity
- Instruction
- Self-monitoring
- Self-Escalation

Virtual Ward (Hospital supervised)

- Higher acuity
- Instruction
- Self-monitoring
- Self-Escalation
- Advanced treatments

Long term care of Chronic diseases
- COPD/Asthma
- IPF/Long COVID
- Cystic Fibrosis
- ID/SMI
- HIV/Cancer
- Arthritis

Long term care of chronic diseases
- COPD/Asthma
- IPF/Long COVID
- Cystic Fibrosis
- ID/SMI
- HIV/Cancer
- Arthritis
Remote monitoring at scale requires specialist skills and training within a specific governance framework to support appropriate decision making and escalation.

Multiple levels of monitoring dependent on patient need, with a variety of access point Mobility through tiers with single platform.

Stratified service offer with a variety of pathways, monitoring capabilities and deployed across multiple providers allows for admission avoidance and expedited discharge to be added to the impact of the.

The level of patient need defines the level of monitoring with clear clinical pathways and escalation.
Covid and Respiratory Virtual Ward care

- Covid Patients
- Respiratory patients
  - COPD
  - Bronchiectasis
  - Community Acquired Pneumonia
  - Asthma

**Patient Identified suitable for VW**

- Patient on-boarded to telehealth
- App based platform installed
- Telehealth kit supplied
- Welcome call by telehealth hub

**Daily monitoring of parameters and completing symptom survey**

- Question set to identify improving, stable or deteriorating trend
  - BP
  - Pulse
  - Oxygen Saturations
  - Temperature

**Check in by Telehealth Hub Nurse if Symptoms/Parameters not inputted**

**Telehealth monitoring via DOCABO**

- Escalation thresholds defined and set by respiratory team

**Continued to monitor. Discharge after 7-14 days**

**URGENT Escalation to Respiratory Team or Emergency Department**

- Phone call from telehealth nurse.
  - Discussion on daily ward round

- URGENT Escalation to Respiratory Team or Emergency Department

- Dedicated Virtual Ward “Caseload”
- Respiratory Team have “read access” to Telehealth to view readings/parameters at anytime including trends

- Check in by Telehealth Hub Nurse if Symptoms/Parameters not inputted
‘If you always do what you’ve always done, You’ll always get what you’ve always got’

Henry Ford

Thanks to Matt Inada Kim for sharing many of his slides :0)