The Royal Melbourne Hospital

RMH COVID-19
Home Monitoring Program

The Royal Melbourne Hospital

Introduction

In February 2020 SARS-CoV-2 was detected in Australia and, as local transmission appeared inevitable, a disaster response was initiated. It was anticipated that hospitals would be overwhelmed with hundreds of patients arriving daily and all hospital beds, particularly ICU, in far greater demand than could be supplied. To assist in offsetting the demand, this program was conceptualised.

Background

If sustained local transmission of SARS-CoV-2 in Australia ensues, health services must prepare to assess and manage potentially overwhelmingly large numbers of infectious patients with a wide spectrum of clinical disease. Many patients will be discharged home with a diagnosis of COVD-19 with instruction to self-isolate and self-monitor and to return to hospital only if significantly unwell.

For some patients, the clinical course will remain mild, and will not require further medical intervention. However, there will be a subset of patients who do not need urgent inpatient admission but are at increased risk of deterioration and death over the course of their illness. Preliminary natural history data from China indicates risk factors may include people aged over 60 years and those with comorbidities including hypertension, diabetes, cardiovascular disease, and cancer. The time period between symptom onset to severe symptoms (defined as hypoxia (SoO2<93%at rest) or tachypnoea (>30bpm)) is on average, a week.

Home based mobile phone linked physiological monitoring may provide a safe and feasible approach to monitoring of these patients. This approach has been used successfully in Australia in settings such as cardiac rehabilitation for patients who cannot access inpatient care[2]. Versions are being trialled during this pandemic. Technological developments have led to availability of low-cost oxygen saturation monitors. At a cost of approximately $52 per household, a monitor could be provided to ambulatory patients at higher risk of deterioration.

If local transmission of SARS-CoV-2 remains uncommon and intermittent, then current healthcare resources may be sufficient to manage demand. The home monitoring model can be transformed from a tool to assist with disaster management to standard care for selected patients.

Overview

Aim: to reduce the need to admit patients to hospital but to provide ongoing monitoring to detect deterioration due to COVID infection.

Setting: Home-based ambulatory patients of the Royal Melbourne Hospital

Patient selection:

1. Inclusion:
    a. Patients who are deemed intermediate risk based on age and comorbidities (see Appendix A)
    b. Access to a smartphone and able to use it

Referral Sources:

1. Inpatients for discharge from hospital
2. Ambulatory patients identified via ED or COVID screening clinic

User Groups:

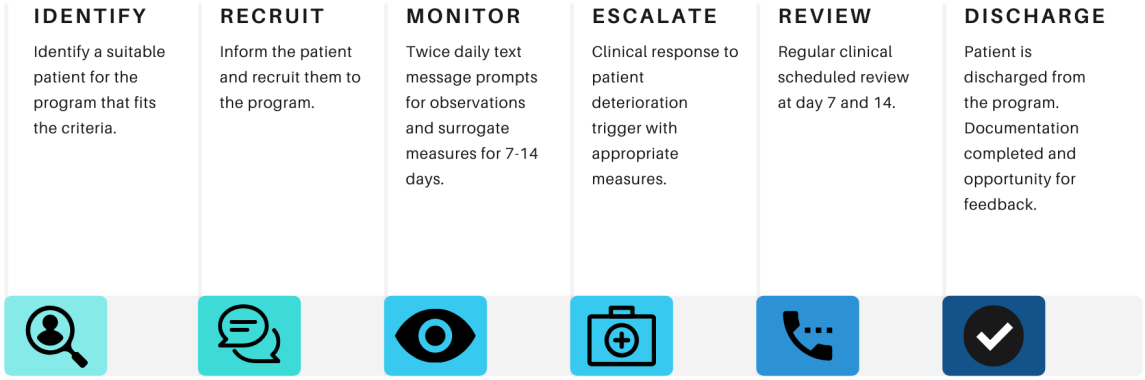
1. Referrer
2. Patient
3. Intake Coordinator
4. Clinician
5. Super-user (Admin)

Patient Categories:

1. Patient Risk Status - Low, Medium, High (See Appendix A)
2. Patient Location - Home, Hospital, Discharged
3. Patient Monitoring Status Phases - Recruitment, Monitoring, Paused, Escalation, Discharge

The RMH COVID-19 Home Monitoring Program

The RMH COVID-19 Home Monitoring program consists of 6 distinct processes linked together to provide a service: identify, recruit, monitor, escalate, review, discharge.

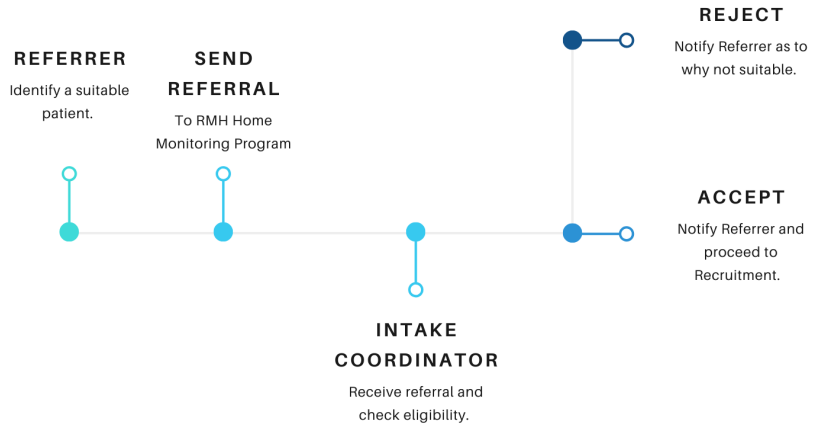


1. **Identify**: Patients who have tested positive will be screened using a risk matrix that incorporates age, comorbidities, and supports (see Appendix A). Those at moderate risk, who can remain at home but might deteriorate over the next few days are identified as suitable candidates for this program.

   User groups: Referrer & Intake Coordinator

   Process:

   1. Referrer identifies potentially suitable patient with diagnosis of COVID-19 for RMH COVID-19 Home Monitoring Program as per risk matrix (See Appendix)
   2. Referrer sends referral with required information to RMH COVID-19 Home Monitoring Program
   3. Intake Coordinator receives and acknowledges referral for suitable patient and confirms patient eligibility.



2. **Recruit**: Once identified, patients will be provided with a verbal description of the program and written patient information leaflet that contains details of the program, the data being collected, the expected range of normal vital signs, when to be concerned and how to contact RMH staff. Consent to be enrolled in the program is recorded. Patients will be trained in the use of the REDCap support software and home monitoring devices (pulse oximeter and thermometer). Patients will have an opportunity to ask any questions.

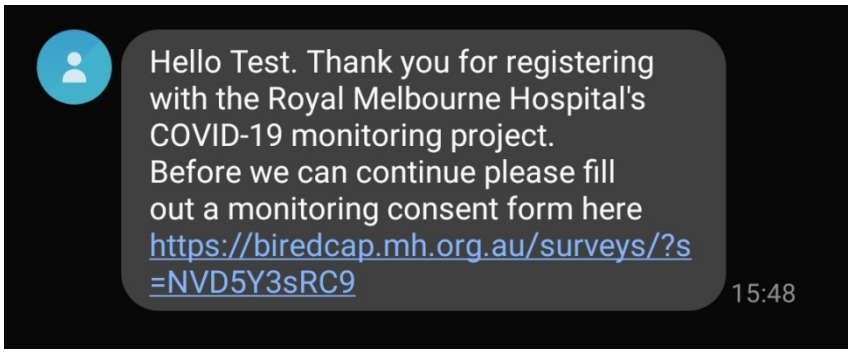
   User groups: Intake Coordinator & Patient

   Process:

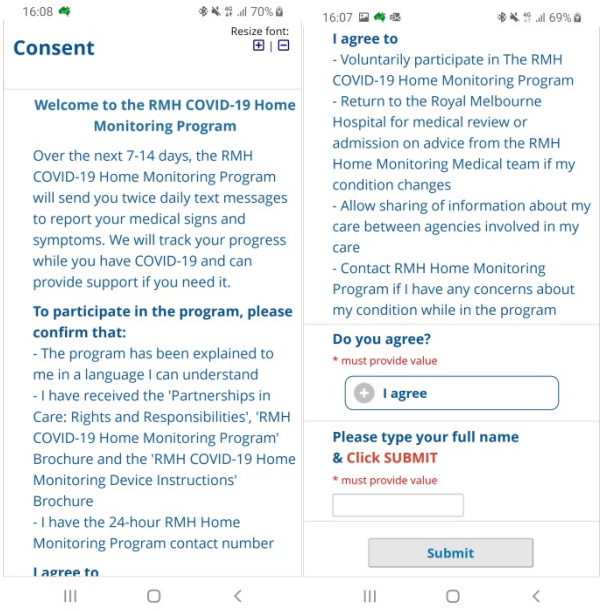
   1. Intake Coordinator to contact Patient and provide a verbal explanation of the program. An example includes:
      "*Hello <Patient_Name>, it's <IntakeCoordinator_Name> calling from the Royal Melbourne Hospital. How are you feeling? Are you ok to talk for a few minutes? The reason I am calling is that you have been referred to our program - The Royal Melbourne Hospital's COVID-19 Home Monitoring Program. Our program provides support to individuals with COVID-19 during their illness for 1-2 weeks. If you choose to participate, we would provide you with two devices that allow you to measure your heart rate, temperature and oxygen levels. We would then send text messages to your phone, twice a day, which would request you to record your heart rate, temperature and oxygen levels and it would ask you a few questions about your symptoms. This allows us to monitor your progress and provide support when needed. We would also provide you with a contact phone number for our doctors incase you become unwell at any point. The program is voluntary, you may stop at any point and all information is completely confidential. Are you happy to participate in this program? Do you have any questions at this moment?*
      Do you own a Smartphone?

   2. If agreeable to participate, the Intake Coordinator must coordinate the delivery of the COVID-19 Home Monitoring Program Patient Pack to the patient - i.e. home or ward setting and completes the Patient Registration Form. Accessible here: redcap.link/RMHHMP
      a. Intake Coordinator to enter patient details into the Patient Registration Form including Hospital URN, Date of Birth, Referral Documents/Files, Monitoring Group (Ineligible/Bidaily).
         i. Ineligible is a record of patients deemed not suitable for the program i.e. unable to contact patient, patient declined, No smart device, language barriers etc)
         ii. Bidaily will trigger the twice daily SMS messages program.
      b. Intake Coordinator to enter patient details including patient location (Home/Hospital), symptoms start date, # of days of monitoring (1-14), patient name, email address, mobile phone number, home address, emergency contact details, past medical history, medical devices provided, alert thresholds and Intake Coordinator (Clinician) name.

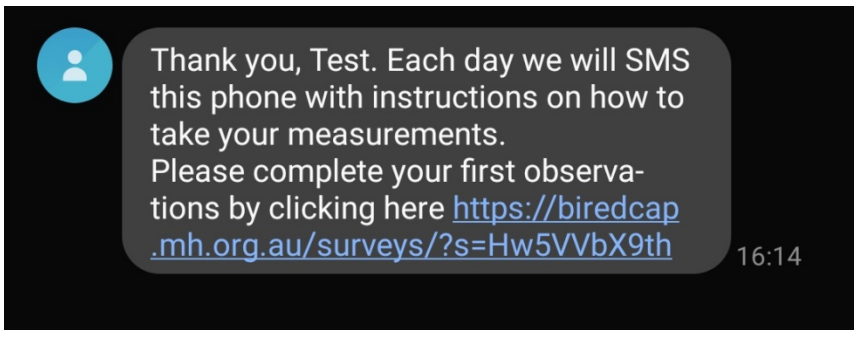
3. On Submission of the Patient Registration Form, the Patient should receive a text message on their mobile device from the program.



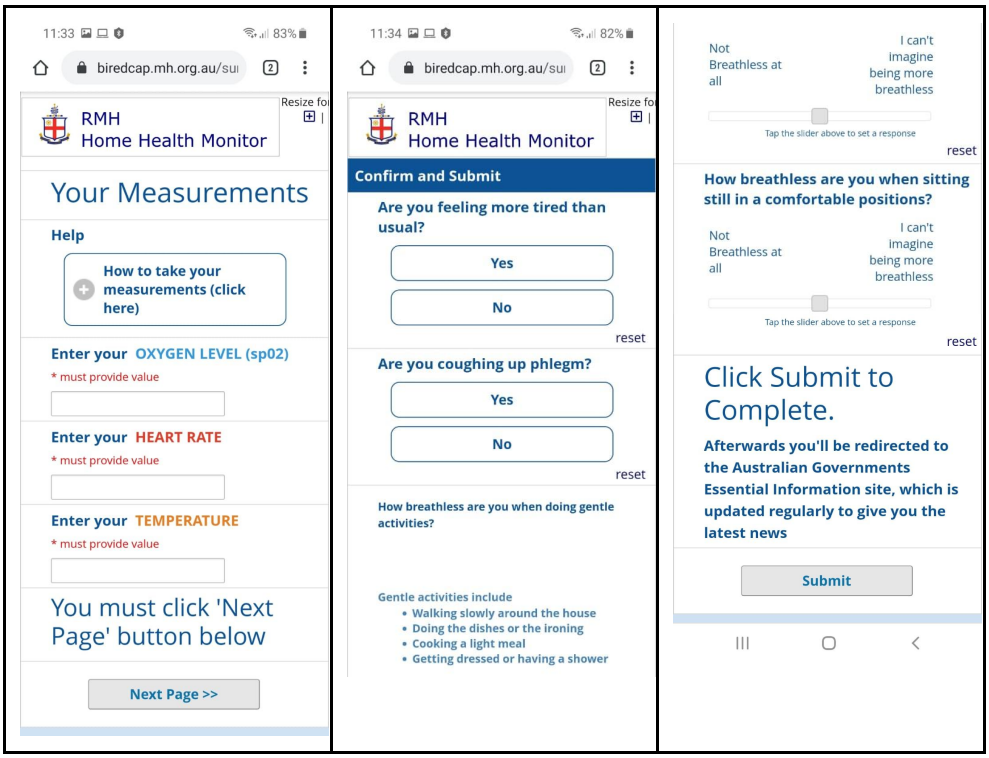
4. The Patient clicks on the link, reads the information provided, agrees to participate in the program, enters their name and clicks submit.

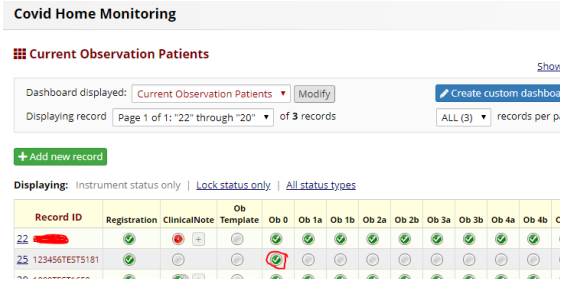


5. Following completion of the consent process, The Patient will receive another message with a link to complete their first observations.

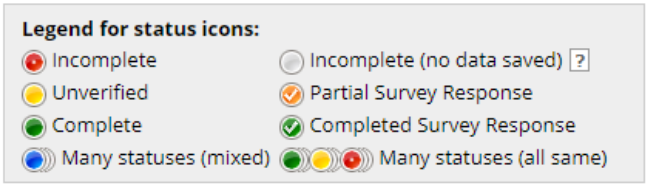


6. Once the Patient is in possession of the COVID-19 Home Monitoring Program Patient Pack, the Intake Coordinator should provide verbal instructions to the patient on how to use pulse oximeter and temperature probe via telephone. Written instructions are also emailed to the patient.
7. The Patient measures and records their own measurements and answers the questions.



8. The Intake Coordinator checks the REDCaps system to confirm D0 patient measurements are complete.
    a. Login to REDCaps / Covid Home Monitoring Project - https://biredcap.mh.org.au/
    b. View the Record Status Dashboard in the Data Collection Section
    c. If the Patient has successfully completed their first observations, then the Ob 0 will have a green circle with a tick.
    d. 

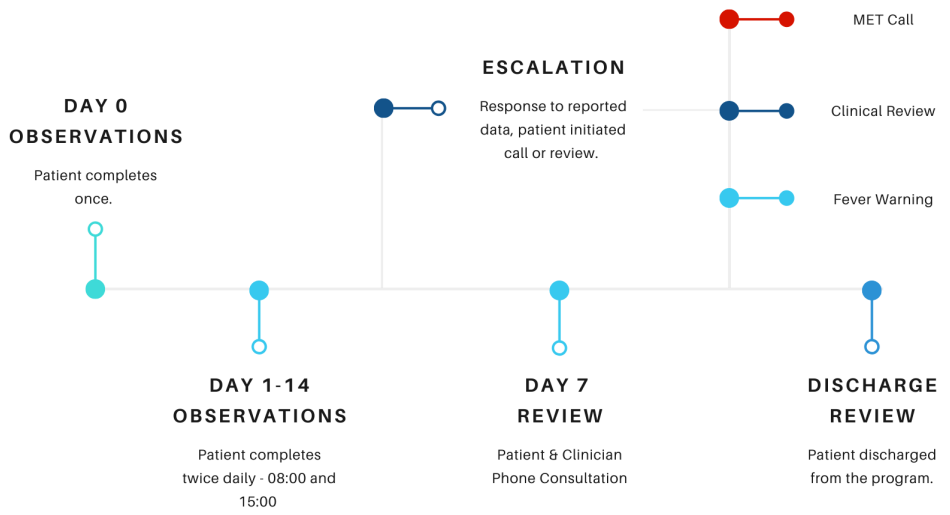
    e. If this is not a green tick the following legend applies:



f. If the Patient has not completed their measurements within 1 hour. Please call again to troubleshoot.

9. Registration is now complete, the Patient progresses to the Monitoring Phase.

Overview of Monitoring, Escalation, Review and Discharge



3. **Monitor**: Once recruited, the patient will receive twice daily text messages on their mobile device requesting the measurement and recording of their oxygen saturation, heart rate and temperature as measured on their home monitoring devices. Data will be recorded in a Redcap form, accessed via a link within the text message (The same as the D0 observations). Symptoms questions included in the data request form include:
    - Noticeable fatigue - Y/N
    - Productive cough - Y/N
    - VAS rating of perceived exertion on minimal exertion (~2 METs, walking or light housework)
    - VAS rating of perceived exertion at rest

    User Groups: Patient

    Process:
    1. The Patient will receive daily text messages at 08:00 and 15:00, requesting measurement of their observations and symptoms.
    2. The Patient completes the same process of measuring their oxygen, heart rate and temperature using the devices.
    3. The Patient enters the data into the ‘Your Measurements’ form accessed by clicking on the link in the text message.
    4. The Patient submits the form which sends the data to the REDCaps platform.
    5. The REDCaps platform determines if the data entered by the Patient is inside or outside normal ranges and responds accordingly. If it is inside, then further no action is completed. If outside, then then the process enters the escalation phase.
    6. If the Patient does not complete the first response request. Two reminder SMS are sent to the patient (At 2 hours and 4 hours i.e. 10:00 12:00 / 17:00 19:00). Afterwards the Clinician is notified via SMS at 5 hours (13:00 / 20:00).

4. **Escalation**

Escalation occurs by three possible methods in the RMH COVID-19 Home Monitoring program - Patient Reported Observations, Patient Initiated, Clinician Initiated.

User Groups: Clinician & Patient

a. Patient Reported Observations
   i. The patient enters their daily observations in the regular reporting that is outside the limits set.
   ii. Standard Alert Thresholds and Outcomes

Alert Threshold	Value	Outcome
Temperature	> 38	Fever warning
	> 38.5	Clinical Review
	> 42	MET call
Oxygen Saturation	< 95	Clinical Review
	< 90	MET call
Heart Rate	> 120	Clinical Review
	< 50	MET call
	> 130	MET call

A **Fever Warning** is an automated text message to the patient.

1. "Hi [name_first], It looks like you're running a temperature. If you feel unwell, you might like to take 2 Panadol every 6 hours. - Covid Home Monitoring Team 0482525929"

A **Clinical Review** results in an automated text message to the patient and clinician.

1. Patient text message - “Hi [name_first], It looks like you may be unwell. If you think you are getting worse, don't hesitate to ring us. - Covid Home Monitoring Team 0482525929.”
2. Clinician text message - “Warning Clinical Review: <Patient Name>, has just recorded <Patient Obs - HR/SATS/TEMP>, phone is <Patient Phone Number>. Open this record and record your response <Link>.”

CLINICAL OUTCOME: The Clinician should proceed to call the patient and complete a review, determine required response and document the outcomes.

A **MET Call** results in an automated text message to the patient and clinician.

1. Patient text message - Hi [name_first], It looks like you may be unwell. We will try and call you back, but if you don't hear from us, please make your way into hospital. - Covid Home Monitoring Team 0482525929
2. Clinician text message - ALERT MET CALL: <Patient Name>, has just recorded <Patient Obs - HR/SATS/TEMP>, phone is <Patient Phone Number>. Open this record and record your response <Link>.

CLINICAL OUTCOME: The Clinician should proceed to call the patient and complete a review, determine required response and document the outcomes.

b. Patient Initiated
    i. The patient determines that they need to seek support/has called the clinician to report feeling unwell using the support phone number.
    ii. The Clinician receives the call, completes a review and determines the appropriate response and documents the outcome.

c. Clinician Initiated
    i. The Clinician has called the patient for a regular review and determined that the patient is unwell. The Clinician should determine the appropriate response and document the outcomes.

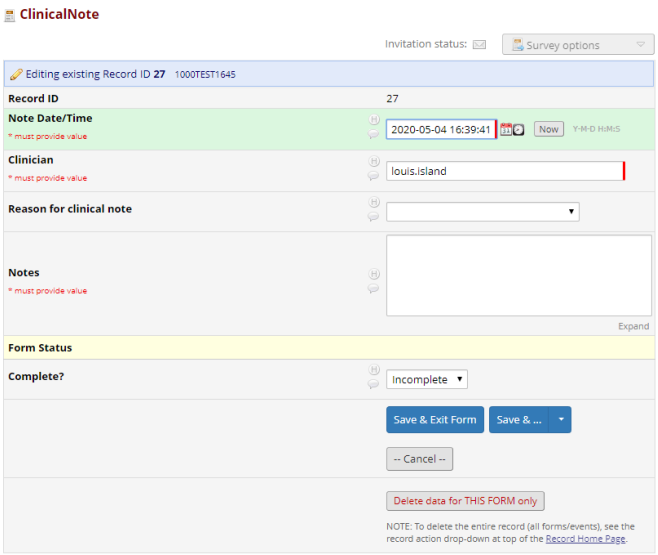
6. **Review**

On Day 7 of the program the Clinician will complete a review of the Patient via telephone. The objective of the review is to assess the patient's progress, answer any health related questions and determine if ongoing monitoring is required.

User groups: Clinician & Patient

Process:

1. The Clinician recieves an SMS to notify them that a patient is due for Day 7 review. Example:
    a. "*Call Reminder: Patient [calc_name_display] (UR [ur]), has been under observation for 7 days. Consider phoning them to touch base.*
    Patient phone is 04xxxxxxxx.
    Patient record:
    https://biredcap.mh.org.au/redcap_v9.8.0/DataEntry/index.php?pid=984&page=registration&id=15&event_id=2780&instance=1
    And/Or add a clinical note:
    https://biredcap.mh.org.au/surveys/?sq=DHnG7ZbbqJ"
2. The Clinician contacts the patient to complete a review via Telehealth or mobile device.
3. The review could include a review of previous observations, current symptoms, current observations, self-management in current setting, external supports, questions/concerns.
4. The Clinician has two options:
    a. Escalate care to Escalation pathway
    b. Continue care to Monitoring pathway
5. The Clinician documents the review using the Clinical Note form, accessible view the SMS or REDCaps portal.



Clinical Note Template

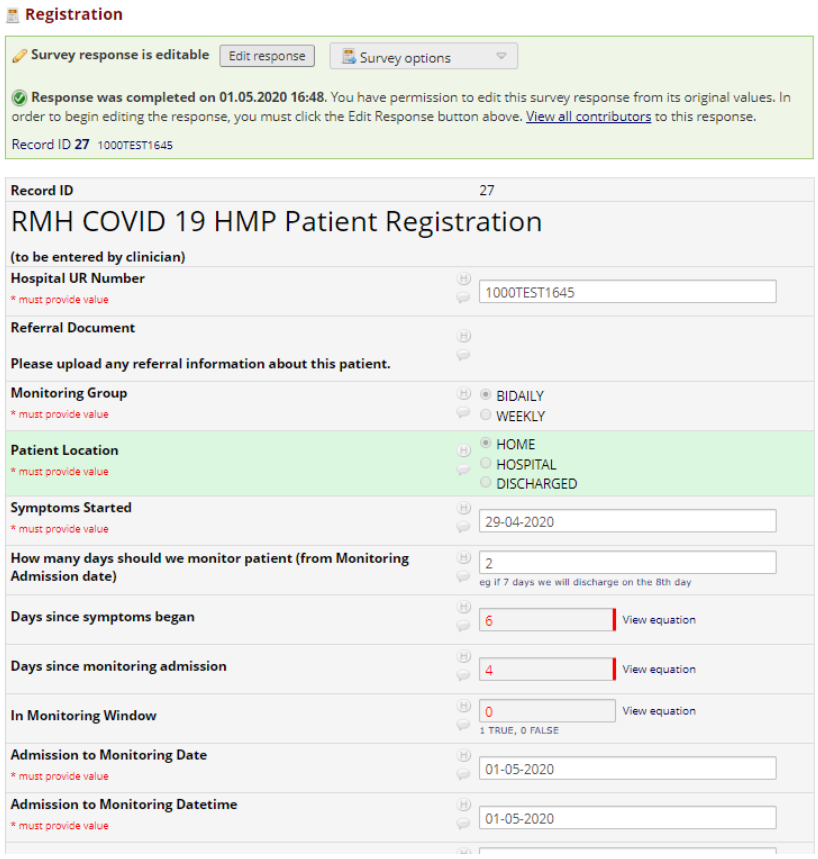
7. **Discharge**

When the Patient's monitoring period reaches the end of its preset value in registration (1-14 days) the daily monitoring text messages cease, the patient is notified that the monitoring is over and the Clinician completes a discharge review.

User groups: Clinician & Patient

Process:

1. The Clinician recieves an SMS/Email to notify them that the Patient has finished their planned monitoring phase and requires review and potential discharge. *"[calc_name_display] (UR [ur]), has reached the end of [mon_period_days] days of their monitoring window and is due to be discharged."*
2. The Clinician is prompted to contact the Patient to determine their current status and progress and if suitable to discharge from the program.
3. If suitable, the patient would be discharged on not receive any further monitoring requests.
4. To Discharge the patient on REDCaps
    a. View the Registration Form of the Patient for Discharge



    b. Click on the 'Edit Response' option to edit the form.
    c. Change the Patient Location to Discharge
    d. Input the Discharge from Monitoring Date
    e. Select the Discharge from Monitoring Reason
    f. Save and Exit the Form.

5. The Clinician should complete a discharge documentation in the ClinicalNote section.
6. The patient would receive a message from the RMH COVID-19 Home Monitoring Team stating - “Hello [name_first], It is now enough time since your symptoms began that your home monitoring period with the Royal Melbourne Hospital can end. If you have any concerns about your virus status you can contact the Covid Home Monitoring Team on 0482525929”

d. The patient should post back pulse oximeter when able.

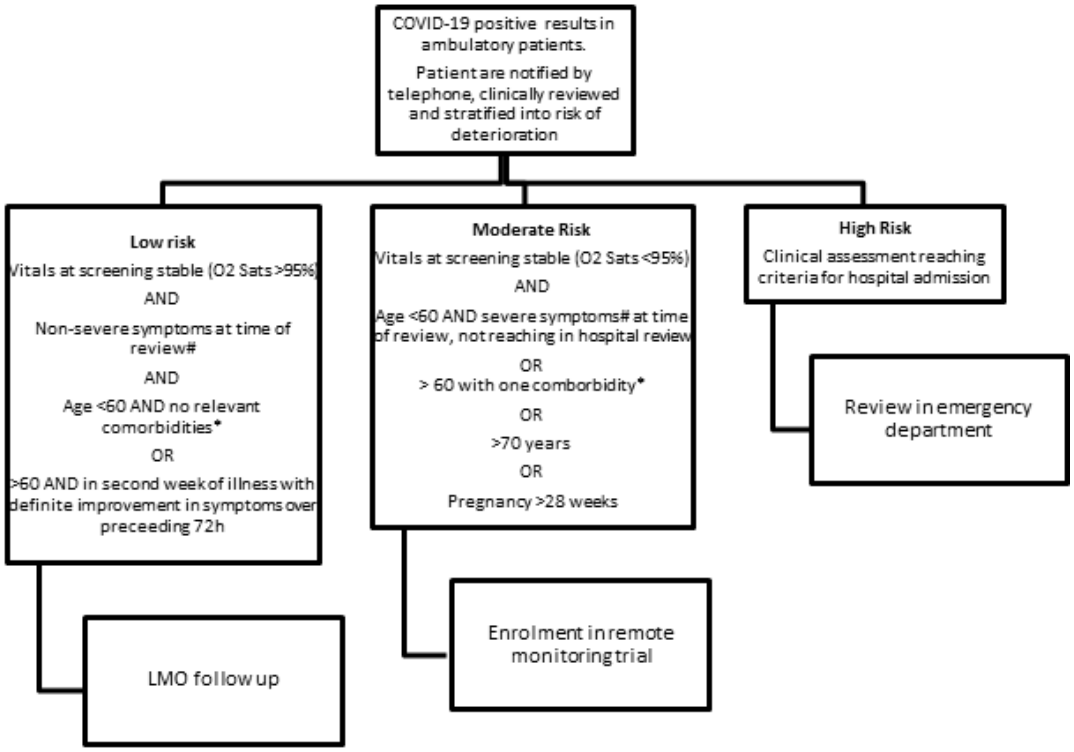
Appendix A: Risk Matrix

Criteria for risk stratification

Low risk: Discharge for follow up with LMO

Medium risk: Admission to RMH@Home "Community" with remote monitoring and support

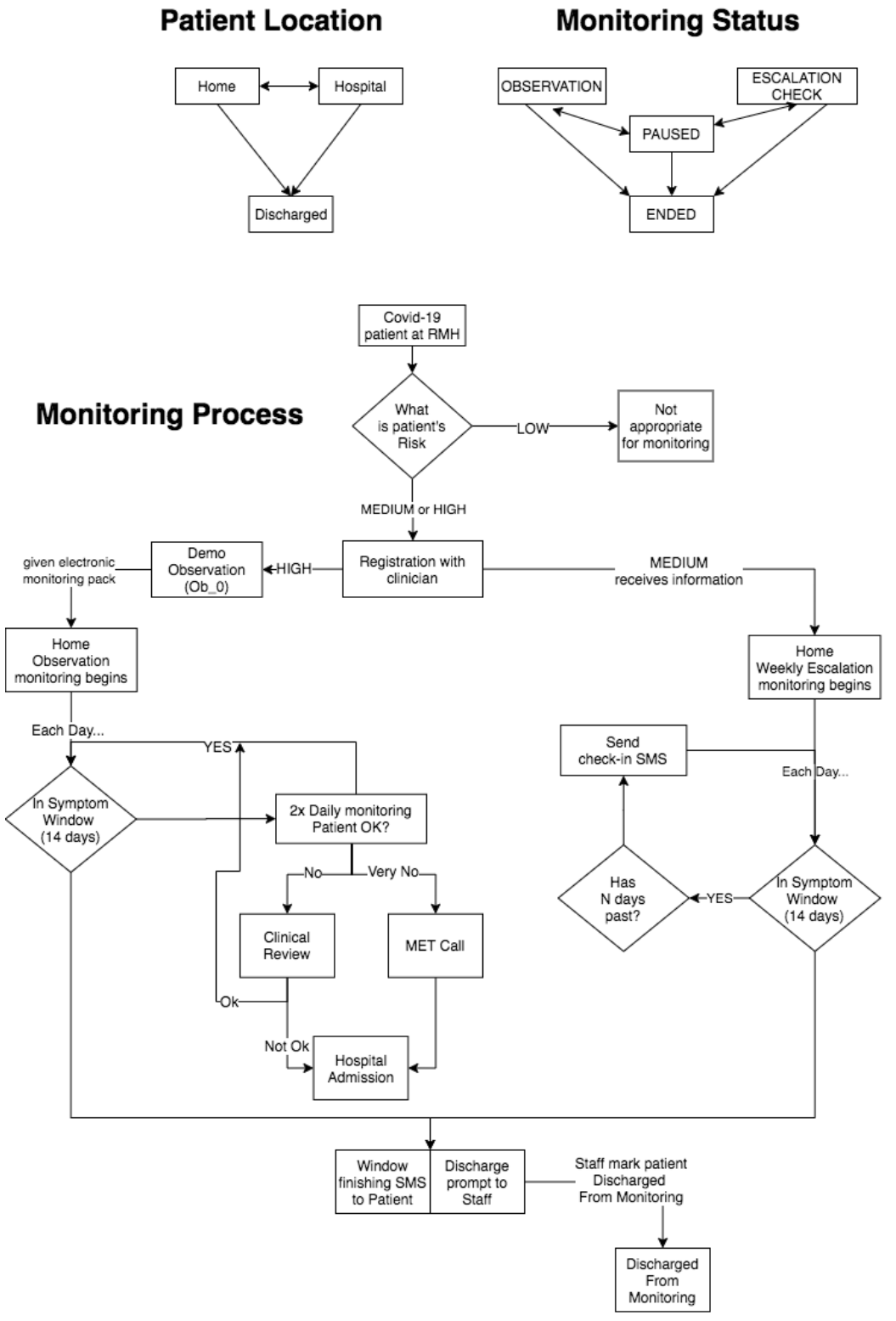
High risk: Inpatient admission



* Relevant comorbidities: Hypertension, Type 1 and Type 2 diabetes, history of cardiovascular disease or cerebrovascular disease, Malignancy with treatment (chemotherapy, radiotherapy or biological therapy in the preceding 3 months), pulmonary disease (severity of asthma – daily preventer), immunosuppressed (20mg or more of prednisolone, disease modifying medication, biologicals or transplant medication)

Rating any one of the following symptoms currently as severe: fever, cough, headache, muscle aches, sore throat or chest tightness

Appendix B: Patient Location, Status & Monitoring Process



RMH COVID-19 Home Monitoring Key Contact List

Staff member	Position	Extension Number	Campus	Mobile
Jonathan Knott	Project Lead	93427000	City	via Switch
Martin Dutch	Project Lead	93427000	City	via Switch
Louis Island	Project Officer	93427000	City	via Switch
Dan Trembath	Technical Officer			

Data Collection Table

Initial Contact	Patient Information: Hospital URN, Location (Home/Hospital), Symptom Start Date, Monitoring Period (1-14 days), Name, DOB, Email Address, Mobile Phone Number, Address, Past Medical History Emergency Contact Information: Name, Mobile Phone Number Program: Name of Devices Provided
Twice Daily Message	Observations: Oxygen Saturations (Sp02), Heart Rate, Temperature Symptoms: Productive Cough (Y/N), Fatigue (Y/N), Visual Analogue Scale of Shortness of Breath at Rest and with light exertion
7 Day Review	Dependant on the Clinician
Discharge Review	Dependant on the Clinician
Patient Satisfaction Survey (Not linked to Patient data)	https://biredcap.mh.org.au/surveys/?s=NNHMD3JLWP Age Group, Post Code, Satisfaction, Registration/Instructions, Confidence with monitoring, Confidence with accessing support, Questions, Suggestions, NPS