

Standard Operating Procedures for the Atrial Fibrillation Virtual Ward

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Version 2.0

Leads	Position
Nicholas S Peters	Professor of Cardiology
Sarah Pearse	Lead Nurse, NWL Virtual Hospital

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<u>Referral to AF Virtual Ward – patients considered to require admission to hospital ONLY - or for early discharge from ward bed</u>	
Referral sources	
• Patients referred from ED, SDEC or AMU following an emergency/urgent attendance with atrial fibrillation (AF).	
• Patients referred directly from the inpatient ward bed space to facilitate early discharge to a virtual ward.	
• Referrers will refer to the AF VW SOP to ensure all referrals are appropriate.	
• If the NWL Virtual Hospital Team are contacted by referring clinicians, they will direct them to this SOP for guidance.	

Exclusion Criteria: consider inpatient admission – discuss with the NWL Virtual Hospital team if in doubt

- NEWS score >5
- Symptomatic hypotension (BP <100 systolic)
- AF with slow ventricular rate <50bpm
- Heart rate >120bpm
- Evidence of haemodynamic instability
- Evidence of sepsis
- Ongoing chest pain
- Ischaemic ECG changes
- Ventricular tachycardia
- Pulmonary oedema requiring supplemental oxygen
- Suspected acute coronary syndrome with troponin elevation above the upper reference limit or uptrending on repeat testing
- History of syncope or pre-syncope
- Pregnancy
- Patient has co-morbidity that warrants hospitalisation in its own right
- Significant other active medical condition requiring inpatient intervention

Inclusion Criteria

- Patient > 18 years old
- Known AF attending due to inadequate rate control OR new-onset AF with inadequate rate control OR inpatient with AF but no other acute medical issues who are amenable to early supported discharge
- Anticoagulation (where appropriate) has been initiated with appropriate counselling
- Patient or carer owns a smartphone with internet connectivity
- Patient or carer able to download the Heart Rate/Rhythm & Symptom App and to follow guidance in leaflet provided
- Patient or carer able and likely to engage with at least twice daily self-monitoring
- Patient or carer able to speak and understand English

How to refer to the AF Virtual Ward

Referral is via a generic virtual ward Cerner form. Referring ED/Medicine clinicians should review the above inclusion/exclusion criteria prior to making a referral. For the AF Virtual Ward, referring clinicians must address the four key criteria below, and this must be documented on Cerner – with the decision to refer made by a named ED/Medicine SpR or Consultant from the treating hospital team:

1. Confirm no other acute medical issue requiring ongoing inpatient care.
2. Confirm anticoagulation commenced including community anticoagulation follow-up where required.
3. Confirm rate control initiated.
4. Patient/carer owns smartphone with internet connectivity.
5. Discuss expected symptoms with the patient and provide the AF VW patient information leaflet (see appendix/intranet):
 - Patients should be reassured that it is normal to experience symptoms from their AF.
 - Palpitations are common and many patients may experience transient, mild dizziness and a tendency to be more breathless on exertion.
 - Patients should be reassured about mild symptoms.
 - This information is available in the patient information leaflet **which must be provided before the patient leaves hospital.**

Clinical work-up in hospital before referring patients to the AF VW

- For patients with new-onset or known AF, with no high risk or red flag features as identified in the exclusion criteria.
- Documentation of demographics, NOK and contact details on Cerner.
- Clerking to establish symptoms, including red flags such as syncope or chest pain, past medical history, drug history, functional status and social history.
- Physical examination to assess for resting heart rate and rhythm, signs of heart failure or structural heart disease.
- 12-lead ECG to assess rate and rhythm.
- Bloods if not performed recently, including FBC, U&E's, CRP, Mg, bone profile, TFTs, troponin (where indicated), clotting.
- Commence background rate control therapy in all AF patients provided no contraindications identified, particularly if HR > 110bpm.
- All patients not already taking anticoagulation should be risk assessed and offered anticoagulation if appropriate. Formal anticoagulation counselling should be provided by a doctor or pharmacist – this may be performed virtually but must be completed prior to referring a patient to the AF VW.
- Referrals to the AF VW do not need to be discussed with the oncall cardiology team unless a particular point to clarify.

AF Virtual Ward for early supported discharge – only for patients who would otherwise remain in a hospital bed

Early supported discharge of patients with the same inclusion/exclusion criteria (page 3) and poor rate control may be enabled via the AF Virtual Ward, with remote monitoring of heart rate and symptoms via the NWL Virtual Hospital.

- Inpatients suitable for this pathway must have no other ongoing acute medical issues that require hospitalisation or inpatient monitoring.
- Patients with AF and a heart rate up to 120bpm can be discharged and followed up via the AF Virtual Ward pathway.
- The ED/SDEC/AMU teams will
 - Deliver clinical care in line with London AF SDEC and ICHT AF pathways, including initiating anticoagulation where indicated.
 - Identify patients meeting inclusion criteria for the AF Virtual Ward.
 - Refer patients to the NWL Virtual Hospital Team.
- ED/SDEC/AMU teams do not need to routinely support patients in downloading the Heart Rate/Rhythm & Symptom App and taking a test recording. This will be done by the NWL Virtual Hospital Team within 24 hours of referral.
- ED/SDEC/AMU teams must ensure patients/carers have a smartphone with internet connectivity before referring to the AF VW.
- ED/SDEC/AMU teams should provide the patient information leaflet which advises patients on how to download the app and perform ECG recordings (Appendix 4).

AF Virtual Ward Referral and Onboarding

Referral routes

A/ Referrals from ED/SDEC/AMU

- Discussed and agreed with the registrar or consultant in ED/SDEC/AMU (documented on Cerner)

B/ Referrals from ward bed space to facilitate early discharge

- Discussed and agreed with the ward medical registrar or medical consultant (documented on Cerner)

A referral by the ED/SDEC/AMU teams (SpR or consultant) should be submitted via the generic virtual ward Cerner form to the NWL Virtual Hospital. This can be found by going to 'Orders' and searching for 'Remote Patient Monitoring' and selecting the AF pathway-. This

should be followed by a phone call to the Virtual Hospital to confirm receipt of referral (02037043704).

Virtual Ward admission and onboarding by NWL Virtual Hospital Team

- The NWL Virtual Hospital Team will admit the patient to the AF Virtual Ward on the Cerner NWL Virtual Hospital bed board.
- The NWL Virtual Hospital Team will admit the patient to the AF Virtual Ward on the Ortus platform and activate the 'ECG Detection' function for that patient.
- Patients will be telephoned by the Virtual Hospital team within 24h, who will:
 - Support the patient to download the Heart Rate/Rhythm & Symptom App to their smartphone.
 - Support the patient to connect the Heart Rate/Rhythm & Symptom App.
 - Confirm that the patient can complete an ECG recording.
 - Remind the patient that they should submit an ECG recording twice per day.
 - Support the patient to use the Heart Rate/Rhythm & Symptom App to submit symptoms if they have them.
 - Explain the traffic light system to patients (see appendix) and highlight safety net advice to the patient.
 - Remind the patient of service hours (0800-2000, 7 days a week) and safety-netting advice.

Patient education and training to use the Heart Rate/Rhythm & Symptom App

- **It is the duty of the referring clinician to confirm patients/carers have a smartphone with internet connectivity to enable monitoring on the AF VW.**
- Patients or their carers should be educated on using and recording symptoms using the Heart Rate/Rhythm & Symptom App.
- The NWL Virtual Hospital Team will familiarise patients with the Heart Rate/Rhythm & Symptom App and provide support to ensure that they are able to use the app and perform resting heart rate measurements by placing their index finger over the phone camera.
- Patients are asked to perform a recording and symptom report on a twice daily basis for up to a two-week period (between 9-10 am and 4-5 pm). On-demand measurements can also be performed whenever the patient is symptomatic e.g. breathlessness, fatigue or dizziness.
- Patients are to be provided information on the **RED-AMBER-GREEN** criteria (see appendix) regarding symptoms and when to contact the NWL Virtual Hospital Team for support and when to seek urgent medical attention.
- Patient material in the form of a leaflet should be provided with further information, patient instructions, troubleshooting advice, recommendations on when to seek medical attention and contact information for the NWL Virtual Hospital for additional support (see appendix).

North West London Virtual Hospital

- The NWL Virtual Hospital is a centralised hub staffed by Specialist Remote Monitoring Nurses who action care pathways for patients who would otherwise require an inpatient bed, in line with standard operating procedures agreed with specialist teams.
- Measurements and symptom entries from the Heart Rate/Rhythm & Symptom App are uploaded onto the platform, where they will be reviewed by the NWL Virtual Hospital Team twice daily.
- Over the remote monitoring period, a traffic light system will be used to flag abnormal parameters and trigger further assessment in a protocolised manner.
- Each patient's measurements will be remotely reviewed by the NWL Virtual Hospital Team at twice daily agreed intervals. Patients will be asked to submit their measurements before the time of their remote review. Patients will additionally be able to submit extra measurements when symptomatic, which will be reviewed by the NWL Virtual Hospital Team at the next twice daily remote review.

- As part of the digital AF workflow, Virtual Hospital Nurse Specialists will have the following responsibilities:
 - Reviewing the heart rate and symptom data via the Heart Rate/Rhythm & Symptom App and the Cerner dashboard.
 - Telephone patients at set intervals (Day 1, Day 7 +/- Day 14).
 - Telephone patients when abnormal parameters are flagged according to the **RED-AMBER-GREEN** criteria (see below and appendix).
 - Telephone patients if they are not engaging with remote monitoring to provide troubleshooting assistance.
 - Support patients on how and when to use the Heart Rate/Rhythm & Symptom App and platform, including the provision of troubleshooting advice.
 - Triage patients if a telephone assessment is triggered by abnormal parameters. This may result in patients being seen in SDEC or patients being advised to seek urgent medical attention via A&E.
 - Escalate to the Cardiology Virtual Ward Team for further clinical support – these are the cardiology registrars supporting the NWL Virtual Hospital (Monday-Friday, 0900-1700). Outside of these hours, the NWL Virtual Hospital Team will escalate to urgent/emergency services as per the safety net advice of the escalation proce

AF VW management, triage and escalation criteria

Symptom advice to patients by the NWL Virtual Hospital during onboarding

- Patients should be reassured during onboarding to the AF VW and throughout their admission that it is normal to experience symptoms from their AF.
- Palpitations are common and many patients may experience transient, mild dizziness and a tendency to be more breathless on exertion.
- Patients should be reassured about mild symptoms.
- Patients are safety netted on the AF VW at onboarding and advised when to seek urgent medical advice based on concerning symptoms or heart rate. This information is available in the patient information leaflet.

RED-AMBER-GREEN criteria

- This traffic light system is the mechanism by which patients are triaged according to the heart rate measurements and symptom entries that they have provided.
- These criteria are embedded within the AF Care Plan/patient information leaflet (see Appendix 4) to instruct patients when to expect to be contacted by a member of the digital monitoring team and whether they need to seek urgent medical attention.

RED:

- Patients with **RED** parameters (HR \geq 120bpm or $<$ 50bpm) or any red flag symptoms (severe/worsening breathlessness, moderate or severe chest pains, blackouts, severe or incapacitating dizziness) will be advised to contact the NWL Virtual Hospital team in hours.
- Any **RED** parameters between 08:00 and 20:00 will trigger a telephone triage assessment by the NWL Virtual Hospital Team (if they have not been called already by the patient). Between 09:00-17:00 (Monday to Friday), the patient will also be reviewed by telephone by the AF VW Cardiology team (SpR/Consultant). If clinically indicated, the AF VW Cardiology team will refer to the appropriate team (e.g. Medical take/SDEC).
- Following review in SDEC or A&E, onward referral to inpatient oncall cardiology may be indicated in cases of challenging rate control, possible pacing indication or alternative cardiac pathology.
- Out of hours, urgent medical attention is advised via the patient's GP or 111.

- In a potential medical emergency, including symptoms of ongoing severe chest pain, severe breathlessness, severe dizziness or blackouts, they should be instructed to call 999 or go directly to A&E. This information is available within the AF Care Plan and should be provided by all healthcare professionals involved in the patient's care.

AMBER:

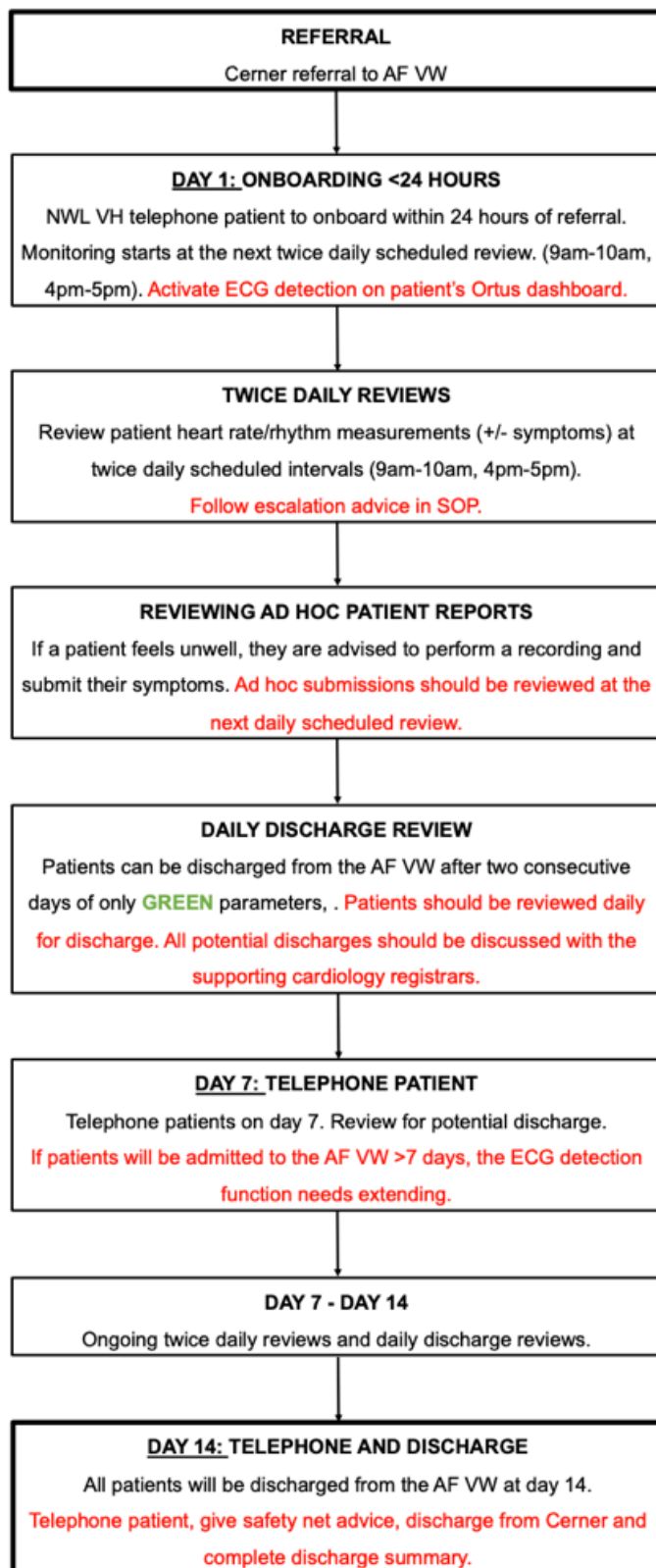
- **Worsening symptoms** at two observation points **PLUS** a heart rate between 110-120bpm or 50-60bpm will trigger a telephone assessment by a member of the NWL Virtual Hospital Team to assess their symptoms. Patients may be asked to attend SDEC or A+E for an in-person review if there are concerns regarding their symptoms, heart rate control or medications.
- Out of hours, if there is a concern that symptoms are severe, patients will be advised to seek medical advice via 111 or 999.

GREEN:

- Symptoms are to be expected and reassurance offered.
- **GREEN** symptoms may include frequent palpitations, mild light-headedness lasting less than an hour, and a tendency to be more breathless on exertion.
- Patients with **GREEN** parameters (HR 60-110bpm throughout) will be discharged from the AF VW after two days of consecutive green parameters by the NWL VH team. Eligibility for discharge will be reviewed daily by the VH team.
- All discharges from the AF VW will be discussed with the cardiology registrars supporting the AF VW.

Set telephone assessments by the NWL Virtual Hospital

- Day 1
 - To address patient queries regarding their remote monitoring, to provide troubleshooting support and to ensure patients are familiar with the AF Care Plan, hub contact information and when to seek support.
- Day 7
 - Activation codes for the Heart Rate/Rhythm & Symptom App are provided for an additional 7-day period when indicated.
- Discharge (any time after two days of consecutive **GREEN** parameters):
 - End of monitoring assessment, which will include review of the rate, rhythm and symptom data generated within the Heart Rate/Rhythm & Symptom App summary report(s).
 - Any patients with two or more **AMBER** parameters, or any **RED** parameters that did not result in escalation to a hospital bed will be presented at the end of the ICHT Electrophysiology MDT on Tuesdays at 08:00 (Microsoft Teams) by the Cardiology Virtual Ward Team, with review of the end of monitoring Heart Rate/Rhythm & Symptom App summary report. A clinical judgement will be made as to whether further cardiology follow up and investigations are required on a case-by-case basis.
 - Prior to discharge, the cardiology registrars supporting the NWL Virtual Hospital will ensure all indicated outpatient investigations and reviews have been requested.
 - The NWL Virtual Hospital Team will complete a discharge summary for each patient using a template (see Appendix 3). This discharge summary will be sent to the patient's GP. This will include a summary report of Heart Rate/Rhythm & Symptom App data, any plans for further investigations/reviews, details of the AF VW admission (including escalations and attendances to SDEC or A+E) and any discussions at the EP MDT.
 - The NWL Virtual Hospital Team will discharge the patient from the AF VW Cerner admission.



1. Onboard <24hr of referral
2. Twice daily reviews
3. Ad hoc patient submissions reviewed at next scheduled daily review
4. Daily discharge reviews
5. Telephone patients on days 1, 7, 14
6. ECG detection function needs activating at onboarding and again at day 7 if the patient is still admitted.

Access to AF Virtual Ward data

- Where clinically indicated, patient-reported measurements and symptom data will be available and readily accessible by cardiology specialists and other clinicians, including ED/SDEC/AMU staff.
- Heart Rate/Rhythm & Symptom App summary reports that include clinically relevant data regarding heart rate, rhythm and symptoms will be uploaded to the patient's medical record on Cerner and will be disseminated to their GP via the virtual hospital discharge summary.

Summary of Roles and Responsibilities

Same Day Emergency Care

- Deliver clinical care in line with London AF SDEC pathway, including initiating anticoagulation where indicated.
- Identify patients meeting inclusion criteria for AF Virtual Ward.
- Provide patients with the patient information leaflet (Appendix 4).
- Refer patients to the NWL Virtual Hospital team using the agreed referral process.
- Ensure referrals are appropriate by referring to the AF VW SOP.
- Respond to clinical escalations of amber or red parameters by the NWL Virtual Hospital Team, including scheduling reviews in SDEC where appropriate.
- Escalate to the oncall cardiology team (HH 9064, CXH 3236, SMH 1001 bleep via Alertive app) for further clinical support when required.

NWL Virtual Hospital Team

- Admit the patient to the AF Virtual Ward on the Cerner NWL Virtual Hospital bed board.
- Telephone the patient within 24 hours, to:
 - Support the patient to download the Heart Rate/Rhythm & Symptom App to their smartphone.
 - Support the patient to register on the Heart Rate/Rhythm & Symptom App and platform.
 - Confirm that the patient can complete an ECG recording.
 - Remind the patient that they should submit an ECG recording twice per day.
 - Remind the patient of service hours (0800-2000) and safety-netting advice.
- Review the heart rate and symptom data via the Heart Rate/Rhythm & Symptom App platform and the Cerner dashboard twice daily.
 - Remind patients via telephone if they have not submitted a recording for 24h and provide technical support as required.
 - Telephone patients when abnormal parameters are flagged according to the **RED-AMBER-GREEN** criteria.
 - Support patients on how and when to use the Heart Rate/Rhythm & Symptom App and platform, including the provision of troubleshooting advice.
 - Triage patients if a telephone assessment is triggered by abnormal parameters. This may result in patients being advised to attend SDEC or patients being advised to seek urgent medical attention via A&E.
- Review patients for discharge daily for discharge: two consecutive **GREEN** days required.
 - Ensure all patients are discussed with supporting cardiology registrars prior to discharge.
 - Complete discharge summary for patient as per the discharge summary template (see Appendix 3).

Cardiology Virtual Ward Team: supporting cardiology registrars

- The NWL Virtual Hospital clinicians and AF Virtual Ward will be supported by two cardiology registrars.
- They are a point of escalation for the NWL Virtual Hospital Team and will provide clinical advice Monday to Friday, 0900-1700.
- Outside of these hours, escalations will be via urgent or emergency care (111, 999, or self-presentation to A+E).
- All discharges will be reviewed by the supporting registrars. Any requisite outpatient actions (investigations, specialist cardiology review) will be arranged by them.

- They will also present patients triggering ≥ 1 red or ≥ 2 amber alerts over the two-week period (or with other clinical concerns) at the ICHT EP MDT (8am Tuesdays via Microsoft Teams) and action any outcomes.

Appendix

Appendix 1	ED / Medicine	Advice on outpatient cardiology referral for patients NOT admitted to AF VW
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Appendix 2	Clinicians / NWL VH	Advice for clinicians: how to support patients using the Heart Rate/Rhythm & Symptom App, including troubleshooting
Appendix 3	NWL VH	Template for AF VW discharge summary
Appendix 4	Patients	Patient information leaflet

Appendix 1: advice on outpatient cardiology referral for patients NOT admitted to the AF Virtual Ward

Outpatient cardiology referral

- Patients should not all be referred to cardiology outpatients.
- **Consider onward referral to outpatient cardiology if:**
 - Symptomatic in spite of HR 60-90bpm
 - History of significant structural heart disease or heart failure
 - Likely to be suitable for rhythm control strategy
 - Likelihood new onset
 - Young
 - Active
 - Reversible cause of AF
 - Refractory to rate control therapy (after discussion with oncall cardiology)
- ONLY patients referred to cardiology OPD should have an outpatient echocardiogram requested, unless they already have an up-to-date echocardiogram from within the last 12 months.
- All patients commenced on rate control therapy and NOT referred to cardiology OPD should have a 24-hour Holter monitor requested to assess the adequacy of their rate control regimen. The result must have a planned review by a designated clinician to ensure results are actioned accordingly. It is the responsibility of the clinician requesting investigations to ensure they are reviewed.

Only patients admitted to AF VW will have their outpatient referral and investigations arranged by the AF VW prior to discharge.

Appendix 2: information for clinicians - how to support patients using the Heart Rate/Rhythm & Symptom App, including troubleshooting

Frequently Asked Questions

Measurement Instructions

3. How long does the measurement take?
4. What should the patient do before taking a measurement?
5. Why can't the patient talk during the measurement?
6. Why can't the patient move during the measurement?

Camera & Finger Placement

7. What camera lens should we use if the phone has multiple camera lenses?
8. Does it matter whether the right hand or left hand is used to measure?
9. Does it matter which finger is used to take the measurement?
10. Should the finger be kept on the camera throughout the measurement?
11. The camera flash is getting warm. What should the patient do?

Sound

12. Can the measurement be taken with the sound off?
13. No sound heard. What should the patient do?

Warnings During the Measurement

14. During the measurement there is a warning 'Don't press the camera lens'. What does this mean?
15. What should the patient do if the app indicates too much movement?
16. What should the patient do when there is a low battery warning?

Problems/ Bugs/ Errors

17. The measurement is not working. What should the patient do?
18. Measurement is frozen. What should the patient do?
19. Unsuccessful measurement error. What should the patient do?
20. The patient took three measurements without success. What should the patient do?

The Science

21. How does the technology work?
22. How reliable is the measurement?

Measurement Instructions

3. How long does the measurement take?

A heart rate measurement will take 40 seconds. An atrial fibrillation measurement will take between 90 to 120 seconds. Occasionally, the patient will have to repeat the measurement more than once.

4. What should the patient do before taking a measurement?

There are a few recommendations to improve the measurement:

- a. Remain still. Don't move during the measurement. It is better to stay seated, keep quiet and just relax.
- b. Place your hand on a stable surface to avoid shaking.
- c. Once you have correctly placed your finger on the camera lens, place your phone with the screen facing down on a flat surface. Do not move your finger or your phone until the measurement is complete.
- d. Make sure your hands are warm. If your hands are cold, the measurement may not work and results may be unreliable.
- e. Make sure you are in a light, bright room. Do not measure in a dark room.
- f. Position your finger properly before you start the measurement. Make sure your finger is fully covering the correct camera lens.
- g. If the measurement fails and your phone has multiple camera lenses, you may be placing your finger on the wrong camera lens. Please try another lens.
- h. Fully cover the camera lens with your finger.
- i. If the measurement still doesn't work, try again using a different finger.
- j. Make sure you are in a room with a stable internet connection.
- k. Don't start measuring when the percentage of your battery is 10% or lower. Recharge your phone and then take the measurement.

5. Why can't the patient talk during the measurement?

When you start talking it will be harder to keep your finger very still and relaxed. It is important to be focused on the measurement by staying as still and relaxed as possible.

6. Why can't the patient move during the measurement?

The reliability and quality of the measurement is decreased when the patient moves. The patient should not take measurements while standing, walking or talking. It is important for the patient to be

focused on taking the measurement and to stay as still and relaxed as possible.

Camera & Finger Placement

7. If the smartphone has multiple camera lenses, which lens is used?

Find the correct camera lens by placing the finger on one camera lens and wait for 3 seconds for the finger to be detected by the app. If the finger is not detected, try the next camera lens and repeat the procedure until the finger is detected.

8. Does it matter whether the right hand or left hand is used to measure?

If you have continuous problems with one hand, it might be good to use the other hand. The blood flow can differ from hand to hand.

9. Does it matter which finger is used to do the measurement?

It is better to use the index finger for measuring, but, if the patient is having continuous problems with one finger try using another finger. The blood flow can differ from hand to hand and finger to finger.

10. Should the finger be kept on the camera throughout the measurement?

Yes, during the measurement the finger must be kept still and continuously on the camera lens.

11. The camera flash is getting warm. What should the patient do?

Please only cover the camera lens and do not cover the flash. Make sure the measurement is taken in a bright room. If the flash is still getting warm, remove the phone case because as this can cause the buildup of heat.

Sound

12. Can the measurement be taken with the sound off?

It is better to keep the sound on because the instructions will explain the process. For the reliability of the measurement, it is better to keep the sound on.

13. No sound heard. What should the patient do?

Make sure the phone volume is on and adjust the phone volume with the buttons on the side of the phone.

Warnings During the Measurement

14. During the measurement there is a warning 'Don't press the camera lens.' What does this mean?

The warning is indicating that you are pressing too hard on the camera lens. The finger must be placed gently on the camera lens.

15. What should the patient do if the app indicates too much movement?

The reliability and quality of the measurement are decreased when there is movement. Therefore, it is important for the patient to remain still and to follow the instructions for a proper measurement. Measurements should not be taken whilst the patient is standing, walking, or talking.

16. What should the patient do when there is a low battery warning?

The phone must be charged on or above 10% for the measurement to be completed. Recharge the phone and then take the measurement.

Problems/ Bugs/ Errors

17. The measurement is not working. What should the patient do?

There are a few recommendations for a successful measurement. Please see [What should the patient do before taking a measurement?](#)

18. Measurement is frozen. What should the patient do?

Close the app and restart it. If this happens multiple times, please contact info@happitech.com.

19. Unsuccessful measurement error. What should the patient do?

Please try again at a later time and follow the instructions carefully. See [What should the patient do before taking a measurement?](#) for recommendations for a successful measurement.

20. The patient took three measurements without any success. What should the patient do?

It is recommended that the patient take a measurement at a later time whilst being careful to follow the instructions. The patient's hands may have been too cold or there was not enough light in the room. See

[What should the patient do before a measurement?](#) for recommendations for a successful measurement.

The Science

21. How does the technology work?

The app is based on the technology called Photoplethysmography (PPG) which measures light reflected in the blood. Blood absorbs light and each pulse increases the blood flow in the body and fingertips. PPG detects and measures the changes in light absorption. The up and down peaks represent the changes in the blood flow i.e. light absorption over time. The method is similar to the one used in a pulse oximeter and many wearable fitness trackers. In these examples infrared light, instead of LED, is used. It is possible to distinguish the difference between a regular heartbeat and an irregular heartbeat.

22. How reliable is the measurement?

Our clinical trial results demonstrate a Heart Rate accuracy of 95% on the low-end model (97%+ higher on newer models) and a Heart Rate variability accuracy of 86.7%.

Couldn't find the answer to your question? Please contact us at info@happitech.com

Appendix 3: template of discharge summary from AF VW

- Patient details, demographics, address, GP information.
- Dates of admission and discharge from AF VW.
- Details of initial referrer to AF VW: brief summary of initial presentation to hospital (A+E, SDEC, inpatient) including which hospital, department, treatment initiated and name of referrer.
- Details of AF VW admission: the Heart Rate/Rhythm & Symptom App summary report; escalations yes/no; detail of escalations if included advice to call 111/999 or attend hospital (including SDEC).
- Details of EP MDT discussion where relevant.
- Details of medications changes during AF VW admission.
- Details of outpatient plans: investigations and OPD appointments.
- One line to patient advising they have now been discharged from AF VW and need to speak with their GP, 111, 999 or A+E for further advice.

Department of Cardiology

Atrial fibrillation Virtual Ward

Information for patients, relatives and carers

Introduction

Introduction – what is atrial fibrillation (AF)?

AF is a common heart rhythm condition. It can cause your heart rhythm to become irregular and your heart rate to become fast. It is normal to experience mild symptoms with AF. Mild symptoms can include the following:

- palpitations: a sensation of your heart beating quickly, beating irregularly, skipping beats or feeling more aware of your heart rate and rhythm than normal
- a tendency to feel more breathless on exertion: you may feel like it's hard to catch your breath or like you're out of breath more often than usual, but this does not stop you doing any of your normal activities
- mild dizziness
- tiredness

Sometimes, people with AF can start to feel unwell and experience worse symptoms which may require medical attention, such as:

- severe dizziness (close to fainting) and fainting
- chest pain
- severe breathlessness

AF can be managed by:

- medications or tablets to control your heart rate and rhythm
- medication to thin your blood (anticoagulation): AF is associated with a risk of stroke. This means blood thinning is recommended unless there is a very strong reason or risk to not start blood thinning
- sometimes, patients may have other procedures such as electrical cardioversion or an AF catheter ablation, to try and cure the AF completely

What is the AF Virtual ward?

After you have been in hospital with AF, it may be possible to continue management of your heart rate and rhythm at home. This service is a safe way to monitor you for up to two weeks following discharge from hospital. The service uses a smartphone app to do this. It allows you to report your heart rate, rhythm and symptoms if you have any. The decision to continue monitoring you on the AF Virtual Ward has been made by the doctors looking after you during your hospital stay.

The AF Virtual Ward service allows people to return home sooner for ongoing monitoring of their heart rate and rhythm, rather than having to remain in hospital. There are important criteria to ensure

discharge from hospital to the AF Virtual Ward is safe. Sometimes, if you become unwell at home, you may need to return to hospital to be assessed by a doctor.

The AF Virtual ward:

- is run via the North West London Virtual Hospital (Virtual Hospital) This is **open 08.00 to 20.00 daily, and contactable on 020 3704 3704.**
- needs you to have a working email address and a smartphone
- involves you measuring your heart rate and rhythm at home and submitting these measurements twice a day. You can find a guide to submitting measurements on page 4

You should make your measurements twice a day during your AF Virtual Ward admission:

- o **submit your morning measurement between 09.00 and 10.00**
- o **submit your afternoon measurement between 16.00 and 17.00**
- o if you experience symptoms when you take your twice-daily heart rate measurements, make sure to click on the 'Symptom' tab on your heart rate and rhythm app to describe how you're feeling
- o please refer to advice in the **RED-AMBER-GREEN** section for further support about what to do if you notice any changes in your symptoms.
- o **remember the Virtual Hospital is active 8am-8pm only.**

The team at the Virtual Hospital, including consultants, will review your twice-daily measurements and symptoms and contact you if further action is needed.

If you feel unwell outside of your twice-daily measurements, you may wish to submit an extra symptom and heart rate and rhythm recording. This submission will be reviewed at the next daily scheduled morning or afternoon review. Please be aware the Virtual Hospital is not a 24/7 service. If you need urgent or emergency help, call 111 or 999.

Joining the AF Virtual ward

1. **Referral to AF Virtual Ward:** your hospital team have decided it is safe for you to return home with continued monitoring via the AF Virtual ward. They will organise this while you are still in hospital and provide guidance on next steps.
2. **Downloading the Ortus App:** you use this app to submit your heart rate, rhythm and symptoms. Download it onto your smartphone, or one belonging to somebody living with you. Please download the app before you leave hospital – the icon is shown on the top left of page 5.
3. **Registration to the AF Virtual ward:** registration will be completed while you are still in hospital. You need to have the Ortus App downloaded onto your smartphone to complete registration.
4. **Learning how to take a heart rate and rhythm measurement:** if needed, you will be shown how to take a recording by staff before you leave the hospital. Also, please see the guide on page 4.
5. **Discharge from hospital to your home:** you will be able to go home once you have been registered on the Virtual Hospital AF ward and your app has downloaded. Your monitoring period on the AF Virtual Ward now begins.

6. **NWL Virtual Hospital:** they will contact you within 24 hours of discharge from hospital. They will explain how the AF Virtual Ward works, provide safety information and explain how to submit an ECG recording using the Ortus app.
7. **Medications:** the hospital team will send you home with enough of your medications. Extra doses may be provided, so that your medication can be altered during your AF Virtual Ward admission. **Do not take any extra medications or doses unless advised by a doctor or nurse.**
8. **Outpatient plans:** some patients require outpatient appointments with Cardiology. This will be arranged by the doctors caring for you in hospital.

Your monitoring period on the AF Virtual ward

This begins once you leave hospital. Patients will be monitored between two and fourteen days, depending if their symptoms and heart rate and rhythm measurements are stable.

Your monitoring period on the AF Virtual Ward includes:

- twice-daily submissions of heart rate and rhythm and your symptoms
- potential changes to your medications
- potential urgent readmission to hospital if you need to be assessed by a doctor.

End of your monitoring period on the AF Virtual ward

The Virtual Hospital will telephone you at the end of your monitoring period on the AF Virtual ward

They will let you know that your remote monitoring period has ended, and what further clinical management is planned. They will provide you and your GP with a discharge summary, to confirm details of your AF Virtual ward admission and ongoing plans.

The traffic light system: keeping you safe

Use the traffic lights to help you decide what help you might need, and when.

Your health and safety are the most important thing, so please remember:

1. The Virtual Hospital is not monitored 24/7.
2. **The Virtual Hospital is open 08.00 to 20.00 daily, 7 days a week: 0203 7043704.**

If you/your loved one is unwell and needs medical attention, call 111 or 999 for urgent or emergency assistance.

GREEN: your heart rate is between 60 and 110 beats per minute (bpm), and you do not have annoying symptoms:

- you feel well, and your heart rate is 60 to 110 bpm
- you may be aware of palpitations (your heartbeat) and mild dizziness lasting under an hour, but you do not feel unwell

What to do:

- continue to submit your twice-daily measurements and monitor for any change in your symptom

AMBER: your heart rate is between 50 and 60 bpm, or 110 and 120bpm for 2 or more consecutive measurements. You may also experience a worsening of your symptoms.

- you are experience troublesome symptoms and feel worse than when you left hospital.

What to do:

- you can contact the Virtual Hospital between 08.00 to 20.00, 7 days a week.
- continue to submit your twice-daily measurements. The Virtual Hospital team will contact you during working hours when they review your measurements
- remember this is not a 24/7 service: if your symptoms worsen and you are worried, seek urgent or emergency medical advice via 111 or 999

RED: your heart rate is below 50 bpm, or above 120 bpm and you do not feel well

- your symptoms are not mild, and you feel unwell. This includes significant limitation of your usual activity due to breathlessness; severe/incapacitating dizziness; fainting/blackout or near fainting; moderate / severe chest pain.
- you need medical assessment or review

What to do:

- **08.00 to 20.00** – call the Virtual Hospital on **0203 704 3704**
- outside these working hours, call your GP, 111 or 999 depending how unwell you feel
- **in an emergency, always call 999 or go to A&E**

Recommendations to patients:

- Please ensure you continue to take measurements and input your symptoms twice daily over the monitoring period. In order to do this, you will need to have the Heart Rate/Rhythm & Symptom App downloaded and be able to access the platform online.
- Take your medications as prescribed. If you think any of your tablets are disagreeing with you, please inform the Virtual Hospital team or your GP.
- **If you experience difficulty in breathing, severe chest pain, severe dizziness or blackouts, seek urgent medical attention.**
- Don't smoke.
- Limit your alcohol intake to the recommended weekly limit.
- Try to be as active as is safely possible.
- Eat a varied healthy diet.
- **It is very important to keep well hydrated and drink at least 1.5-2 litres of water each day.**

You can find more resources online to support you in understanding your condition as well as leading a healthy lifestyle. Please see links below for these resources.

Online resources to learn about your atrial fibrillation

<https://www.bhf.org.uk/information-support/conditions/atrial-fibrillation>

<https://www.heartrhythmalliance.org/aa/uk/atrial-fibrillation>

What is atrial fibrillation? <https://www.youtube.com/watch?v=eZTEc6GwLNs>

Online resources for a healthy lifestyle

<https://www.bhf.org.uk/information-support/support/healthy-living>

How to take your heart rate and rhythm measurement

STEP 01 Click on the Ortus iHealth icon to open the app

STEP 02 Click on the ECG Detection option to begin the measurement.

STEP 03 Carefully Read the Instructions. Select **Next** to proceed.

STEP 04 Please answer if you are experiencing any complaints. Continue by selecting "Yes" or "No" and then select **Next**.

STEP 05 Test your volume. Please click "Test volume" and adjust the volume so you can clearly hear the instructions. Once done select **Next**.

STEP 06 The application will ask for your permission to access your camera.. Please select **Next**. On the pop - up select **OK**.

STEP 07 Please listen carefully to the instructions given. A short video will be played to guide you on performing a measurement.

STEP 08 After selecting **Start** your flash will illuminate. There is a circle on the screen to help locate finger placement on the camera lens.

STEP 09 Once your finger is detected, place your phone with the screen facing down on the table to begin measurement

STEP 10 The measurement will automatically start. Please stay in this position and carefully listen to the voice guidance.

STEP 11 The voice guidance will prompt you when your measurement is complete. Select **Next** or **Done** to continue

STEP 12 Your data has been saved successfully. To review ECG report, Go to Reports section on the home screen and Press ECG

How do I make measurements and record my symptoms?

1. Click on the Ortus iHealth icon to open the app.
2. Click on the ECG Detection option to begin the measurement.
3. Carefully Read the Instructions on how to measure. Select **Next** to proceed.
4. Please answer if you are experiencing any complaints. Continue by selecting **“Yes”** if you have experienced any symptoms before the measurement or **“No”** if you have been feeling well. Then, press on **Next**.
5. Make sure to turn the volume up to listen to the audio guidance. Click on **“Test volume”** and adjust it accordingly to your needs. Once done select **Next**.
6. The application will ask for your permission to access your camera. The app uses the camera to perform the heart rate measurement. Please select **Next**. On the popup select **OK**.
7. Listen to the instructions carefully. The video will show you how to place your finger on the camera lens to perform the measurement. Then click on **Start** to begin the measurement.
8. After selecting **Start** your flash will turn on. There is a circle on the screen to help you correctly place your finger on the camera lens. When your finger is placed correctly, the circle will turn green. Do not remove your finger.
9. Once your finger is detected, place your phone with the screen facing down on the table to begin measurement.
10. The measurement will automatically start. Please stay in this position and carefully listen to the voice guidance. The measurement will last about 120 seconds.
11. The voice guidance will prompt you when your measurement is complete. Select **Done** to save your results.

Correctly placing your finger on a phone with multiple camera lenses:

Find the correct camera lens to measure by placing your finger on one camera lens (starting from the top) and waiting for 3 seconds to be detected by the app. If your finger is not detected, try the next camera lens and repeat the procedure until your finger is detected.

Once your finger is detected, make a note of the correct camera lens for future measurements.



Troubleshooting

Follow these tips and tricks if you are experiencing troubles with the measurement:

- Remain still, don't move during the measurement. It is better to stay seated, keep quiet and just relax.
 - Place your hand on a stable surface to avoid shaking.
 - Turn the volume up to listen to the audio guidance that will support you throughout the measurement.
 - Once you have correctly placed your finger on the camera lens, place your phone with the screen facing down on a flat surface and do not move your finger or your phone until the measurement is complete.
 - Make sure your hands are warm, if your hands are cold, the measurement may not work, and results may be unreliable
 - Make sure you are in a room with enough light, do not measure in a dark room.
 - Position your finger properly before you start the measurement, make sure your finger is fully covering the correct camera lens.
 - If the measurement fails and your phone has multiple camera lenses, you may be placing your finger on the wrong camera lens, please try another lens.
 - Fully cover the camera lens with your finger.
 - If the measurement still doesn't work, try to use another finger.
 - Make sure you are in a room with a stable internet connection.
 - Don't start measuring when the percentage of your battery is 10% or lower, charge your phone and try to measure at a later time.
-

How do I make a comment about my visit?

We aim to provide the best possible service and staff will be happy to answer any of the questions you may have. If you have any **suggestions** or **comments** about your visit, please either speak to a member of staff or contact the patient advice and liaison service (**PALS**) on **020 3312 7777** (10.00 – 16.00, Monday to Friday). You can also email PALS at imperial.pals@nhs.net The PALS team will listen to your concerns, suggestions or queries and is often able to help solve problems on your behalf.

Alternatively, you may wish to complain by contacting our complaints department:

Complaints department, fourth floor, Salton House, St Mary's Hospital, Praed Street
London W2 1NY

DRAFT

Email: ICHC-tr.Complaints@nhs.net

Telephone: **020 3312 1337 / 1349**

Alternative formats

This leaflet can be provided on request in large print or easy read, as a sound recording, in Braille or in alternative languages. Please email the communications team: imperial.communications@nhs.net

Wi-fi

Wi-fi is available at our Trust. For more information visit our website:
www.imperial.nhs.uk