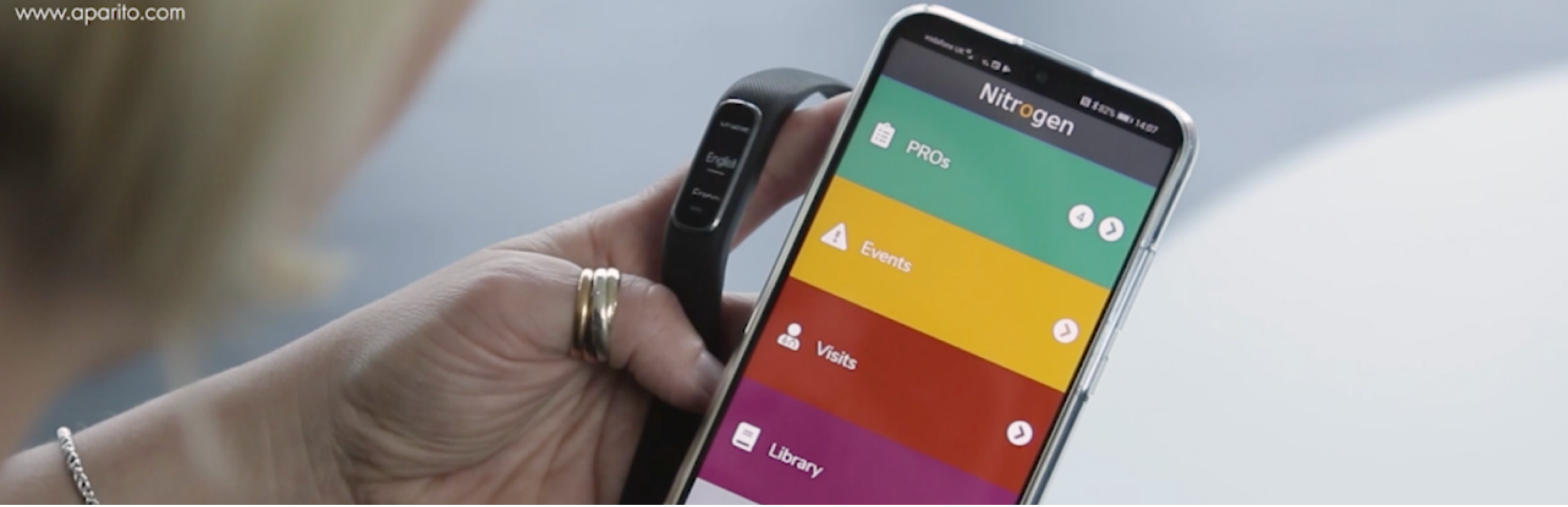

APARITO

GIG CYMRU NHS WALES | Bwrdd Iechyd Prifysgol Betsi Cadwaladr University Health Board

NHSX COVID Response

March 2020

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CONTENTS

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KEY FINDINGS SUMMARY

- Quick deployment, high enthusiasm from staff members and high engagement from patients.
- Need for a patient data view on app to keep their interest
- Development of clinical care dashboard for implementation in the planned future virtual hub deployment

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BACKGROUND

- Patients with cancer who receive systemic anticancer treatment (over 100,000 new cases/year in the UK) experience a wide array of symptoms as a result of treatment **toxicity** and subsequent **complications**. This can, and does, lead to unplanned visits to GP, A&E, acute medicine and acute oncology, with about **20 days** of admissions/patient/year. This results in a negative impact on the patient's **quality of life** and creates a major **capacity** problem to the NHS. Thus, cancer patients use healthcare resources extensively and with continuous improvement in survival this is likely to increase.

- At present, the healthcare system responds **reactively** to patient's demands once a clinical situation has deteriorated to an extent requiring clinical attention.

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BACKGROUND

- COVID-19 crisis means efforts are focused on 1) increasing capacity; 2) reducing need for patients to be admitted
- Systemic anticancer treatment associated with immunodepression has an increased risk of morbidity and mortality from respiratory insufficiency in cancer patients on treatment
- Patients are regularly recalled to hospital for monitoring & treatment especially when reporting symptoms of neutropenic sepsis (e.g high temp, fast heart rate)
- In "normal" circumstances patients are assessed with clinical examination and blood tests then either discharged with oral antibiotics or admitted for intravenous antibiotics and close monitoring of vital signs
- Assessment complicated with COVID pandemic when febrile patients assumed potential virus-positive and at risk of infecting other immunodepressed patients

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AIMS AND OBJECTIVES

- To demonstrate the feasibility of multidimensional remote monitoring of cancer outpatients with digital tools (smartphone app and wearable sensor) through measuring engagement and adherence

- To provide **an innovative digital** resource to allow patients to report **in near-real-time** their health status and specific Covid-19 symptoms to a nominated clinical team.

- Longer term objective: to reduce admissions by proactive monitoring rather than reactive thus **improving cancer patients safety and wellbeing.**

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DEPLOYMENT

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DEPLOYMENT

- Ysbyty Gwynedd is part of the Betsi Cadwaladr University Health Board in north Wales.
- The hospital covers a large, dispersed geography which means that patients can travel for an average of 1.5 hours to attend an appointment.
- Public transport links are extremely limited.
- 1200 patients are currently under their cancer care services.
- Cancer patients under active treatment or surveillance were invited by the clinical team at Ysbyty Gwynedd hospital during routine appointments or via the North Wales Patients Forum
- Shielding population, when not feeling well difficult and finding it difficult to book a rapid appointment with their GP
- COVID-19 peak not reached north Wales yet.
- Not all outpatients appointed, but 90% offered phone (not video consultations when possible)
- Quick deployment achieved in 4 days of contract awarded – including invitation for family members to link on the the AdiLife tracking option.

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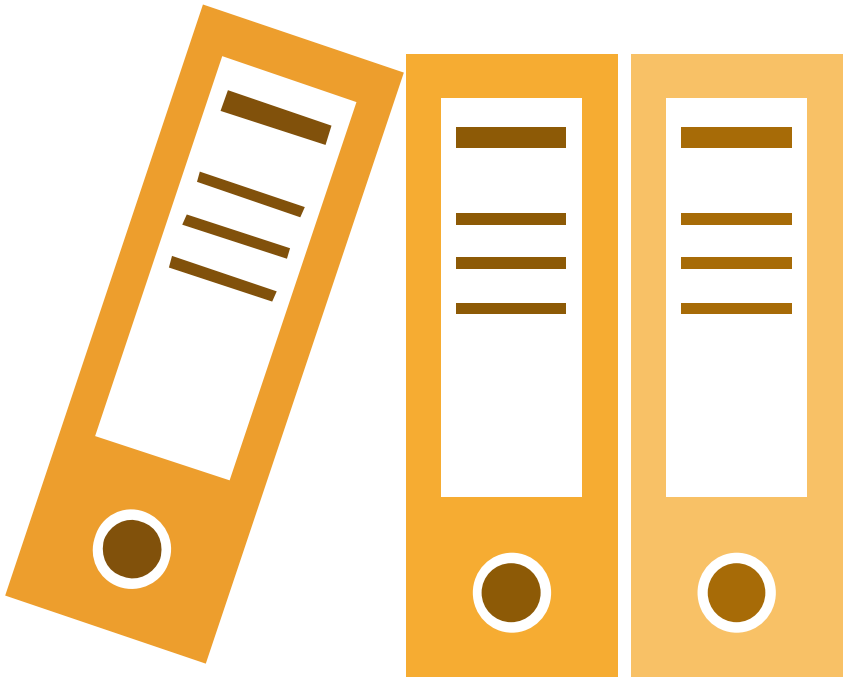
CLINICAL STAFF SET UP

Five step instructions (video instruction sent via email)



1. Send email addresses of who needs to be added to covid-onc@aparito.com Either view only or create and edit
2. Receive email with once off password and instruction to change password within 30 days
3. Log on URL to www.bcuhb-covid.atom5.co.uk
4. Create patients' profile and issue QR codes to link to system
5. Create patients and View patients

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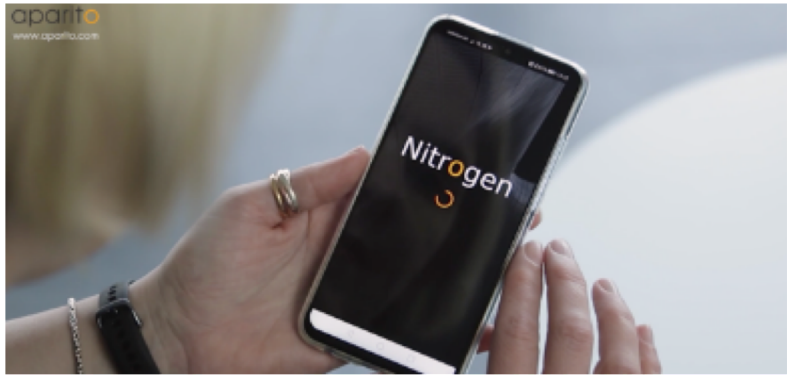
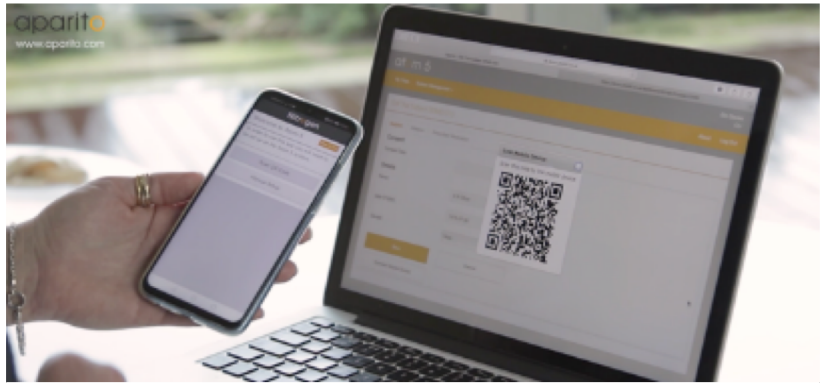
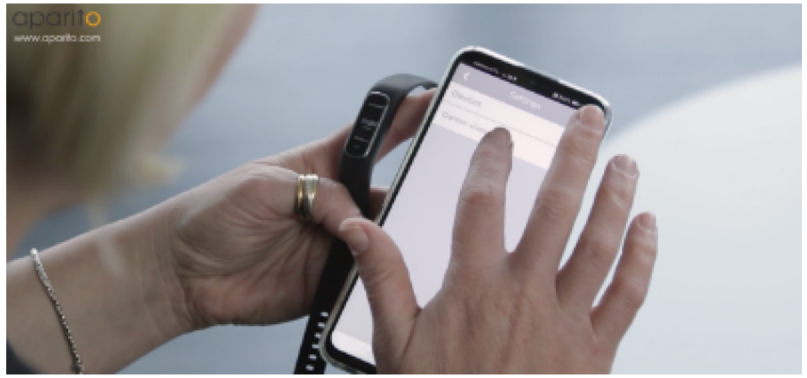
PATIENT SET UP



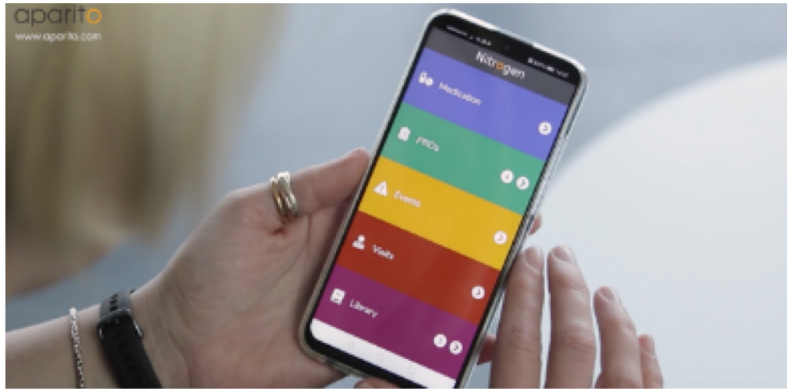
Download **Nitrogen by Aparito**



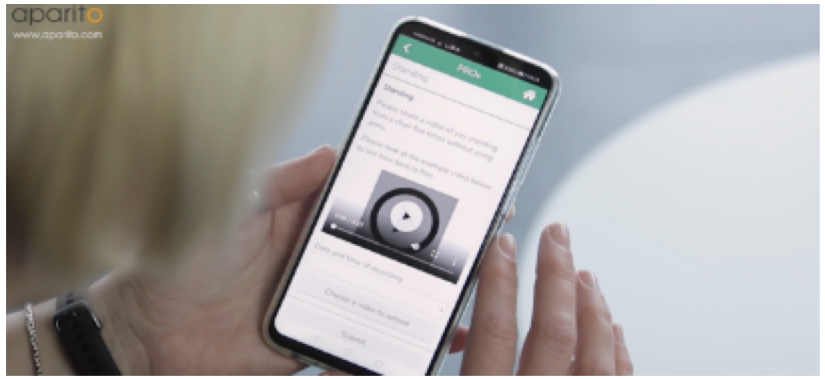
Use QR code to connect App to Atom5™



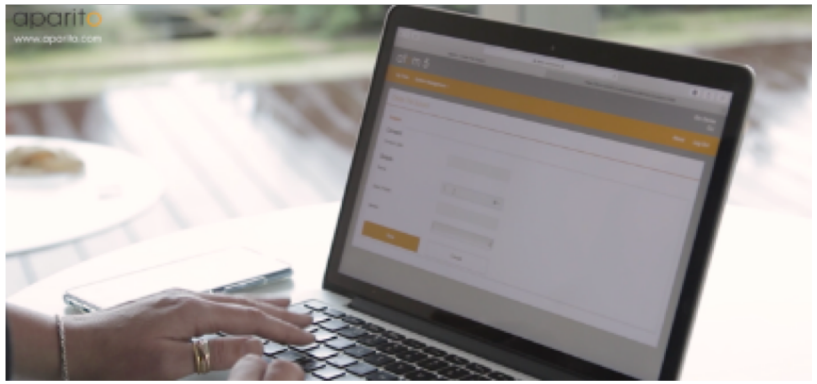
Connect App & Wearable devices



The patient is ready



Collect data remotely



Clinical staff live data review

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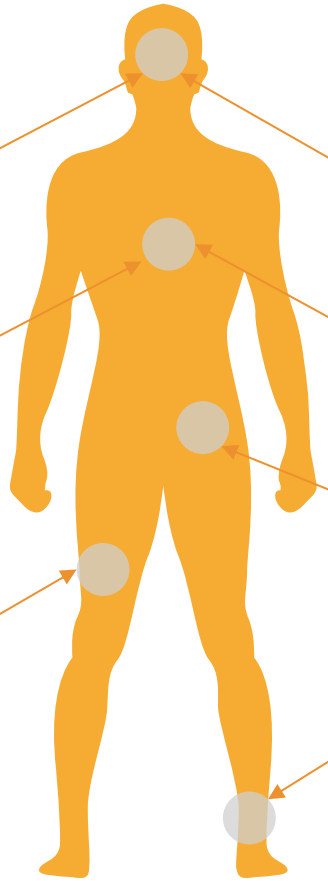
ATOM5™ – WEARABLE INTEGRATION

Aparito's product strategy is to work with the best and most suitable connected devices for any given study's needs.

GARMIN™



Temperature

O2 Saturations

Movement

Sleep

Heart rate

Calories

Steps

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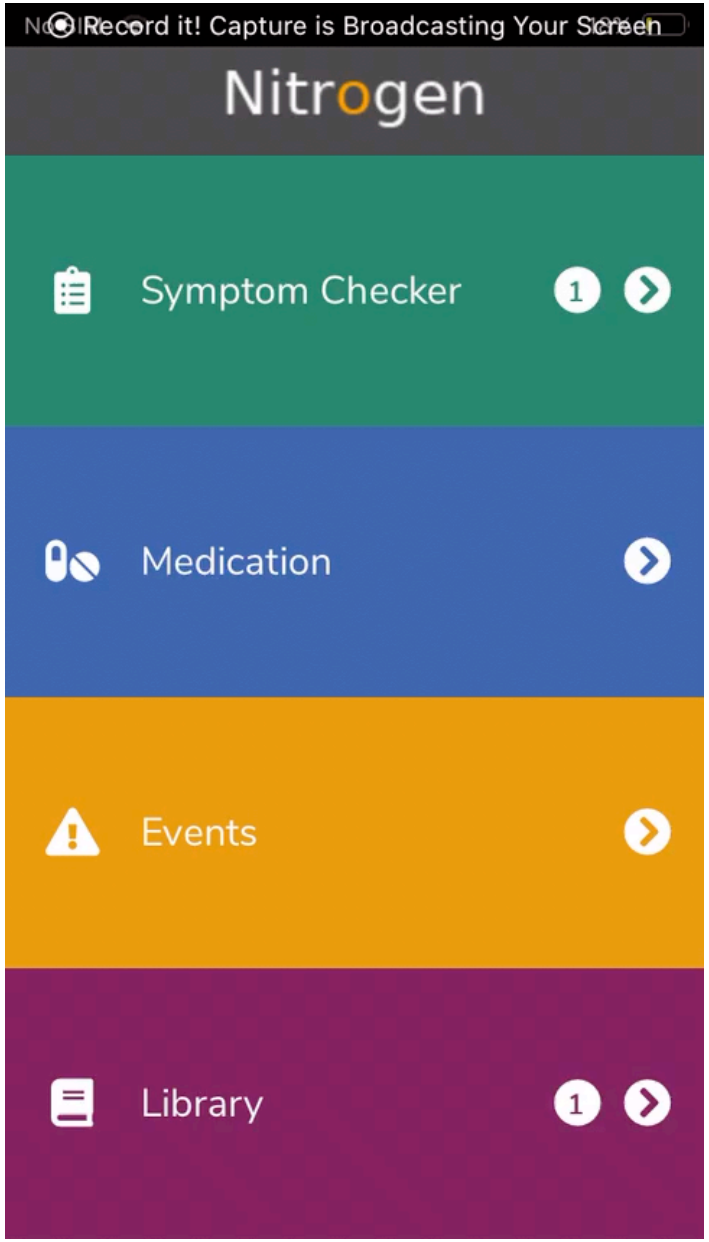
Video of the COVID Symptom Checker



Play video

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ATOM5™ – PORTAL

The Atom5™ Portal provides customers with a customisable experience in terms of the data points they wish to see from what is collected.

All patient captured data can be viewed in real-time to ensure quality and regular uploads. This includes individual patient level and complete cohort analysis of engagement and adherence with the study protocol.

All data that is captured is presented in the dashboard function of the system. As such, the dashboard comes in two main parts:

01 CLINICIAN PORTAL

This allows the clinician to upload clinical data to the system, centralising all data.

02 DASHBOARD

This allows the sponsor to view all patient data in an individual or cohort view.

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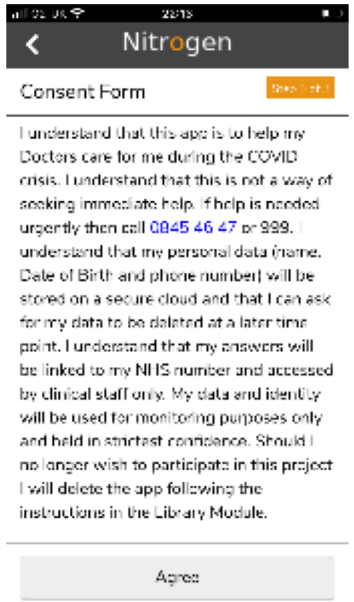
PATIENT CONSENT AND DATA PROCESSING

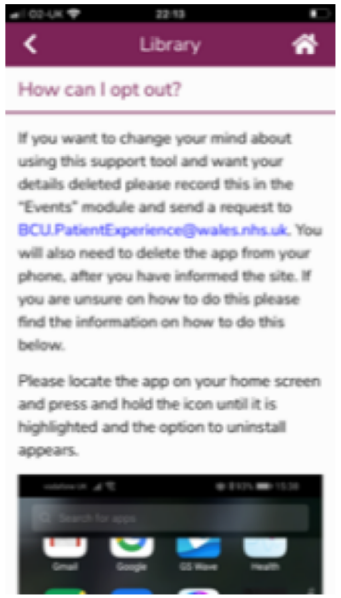
Approached at hospital / on-phone

1. Clinical staff offer the opportunity to take part and document verbal consent and on-board patient with QR code/ app and issue Garmin device

On boarded on-to app

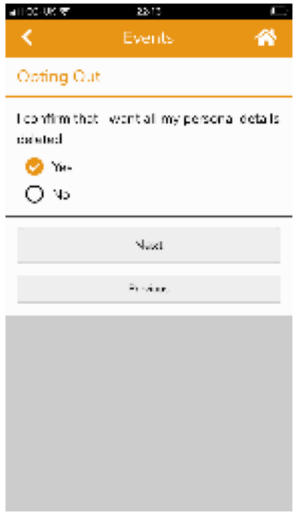
2. QR code given to patient to on-board app and give digital consent





Opt Out option

3. Information in the app on how to opt out on the app



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RESULTS

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ENGAGEMENT

Cohort of users: cancer patients receiving systemic anticancer treatment and clinical staff at Ysbyty Gwynedd, BCUHB, NHS Wales

Process

- On-boarding patients while in clinic not feasible for all:
  - Some couldn't connect to wifi and/or didn't have 4G in the hospital
  - Older patients struggled setting up at home / found it too difficult
  - Staff didn't want their work email being used to issue QR code
- Only two patients refused to try it
- Three didn't have sufficiently good enough smart devices
- Several people didn't know or have ability to download apps on phone as their children monitor their devices and in lockdown they aren't seeing their children

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ENGAGEMENT

Tech and Data

- Generally very well received.
- Main issue is that patients don't see their own wearable data on the app as they would do on Garmin Connect. This might lead to loss of interest by patients long term.
- Older patients also losing interest as the wearable 'face' is small and they can't see it.
- The time you get asked to complete Symptom Checker on the app is fixed – a few people feel the time they are being asked is inconvenient and this being customisable would be helpful.
- Vital Signs configured rules means that one patient is being asked 4 hourly for Spot Checks as her sats are 93% but she feels well and within a week it is becoming tiresome – so it might be that we re-configure the rules
- None of the patient enrolled for the family tracking option via the AdiLife links included in the Library module as an option in the app.

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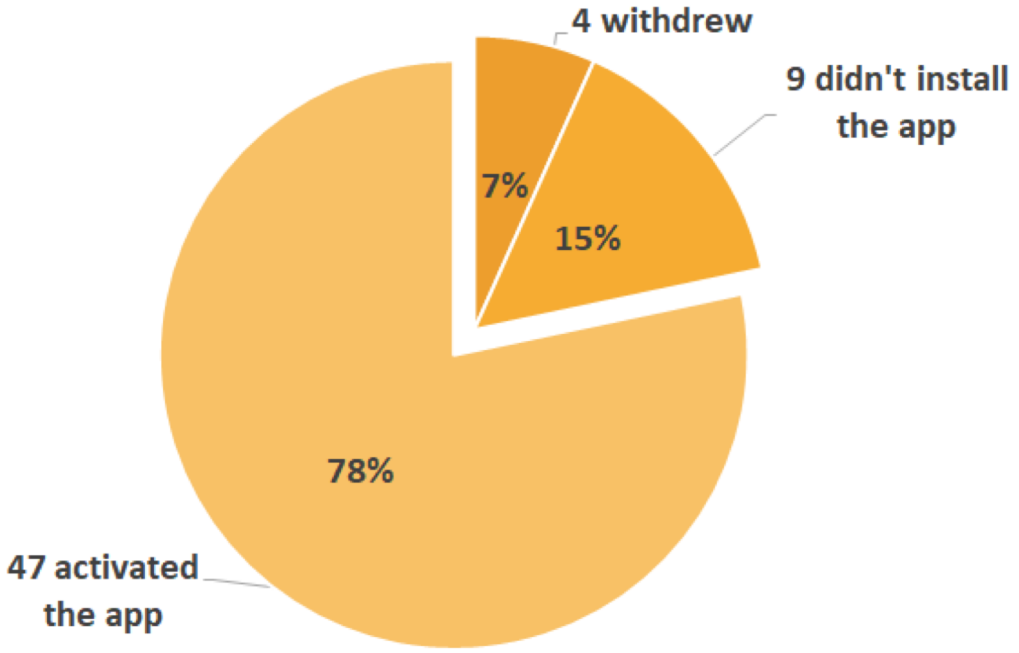
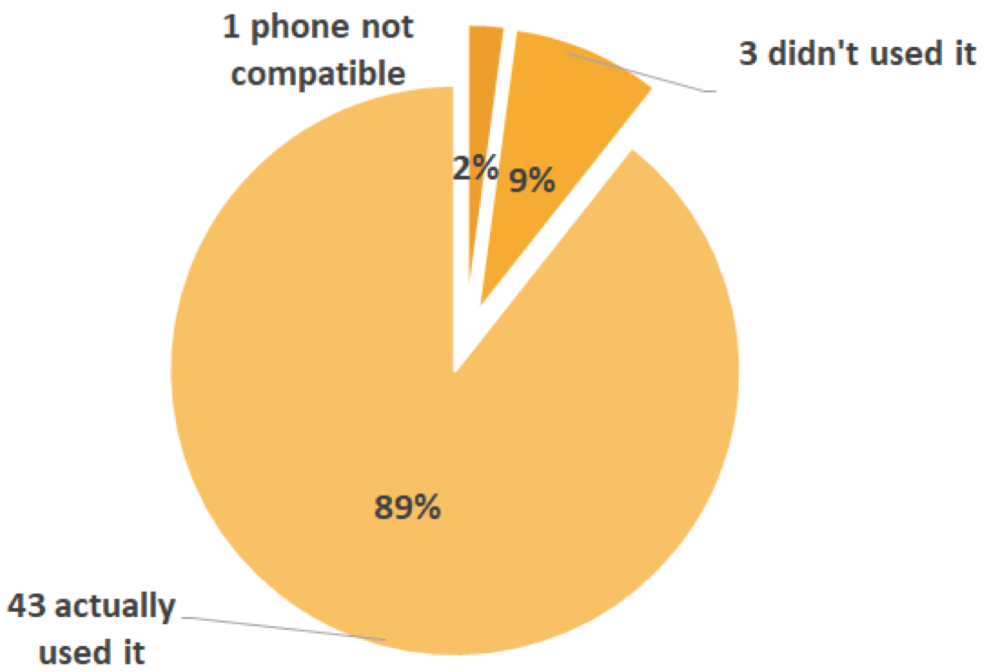
PATIENTS DEMOGRAPHICS

60 patients verbally consented when approached by clinical team.
33 (55%) male and 27 (45%), aged between 31 and 80 years, mean age 62 y.o.
Four (7%) later withdrew. Out of the 43 patients who activated the app and provided data:
23 (55%) were male, 19 (45%) female, mean age 64 y.o. (range from 31 to 79 y.o).



Proportion of patients who verbally consented (N=60)



Proportion of patients who activated the app (N=47)

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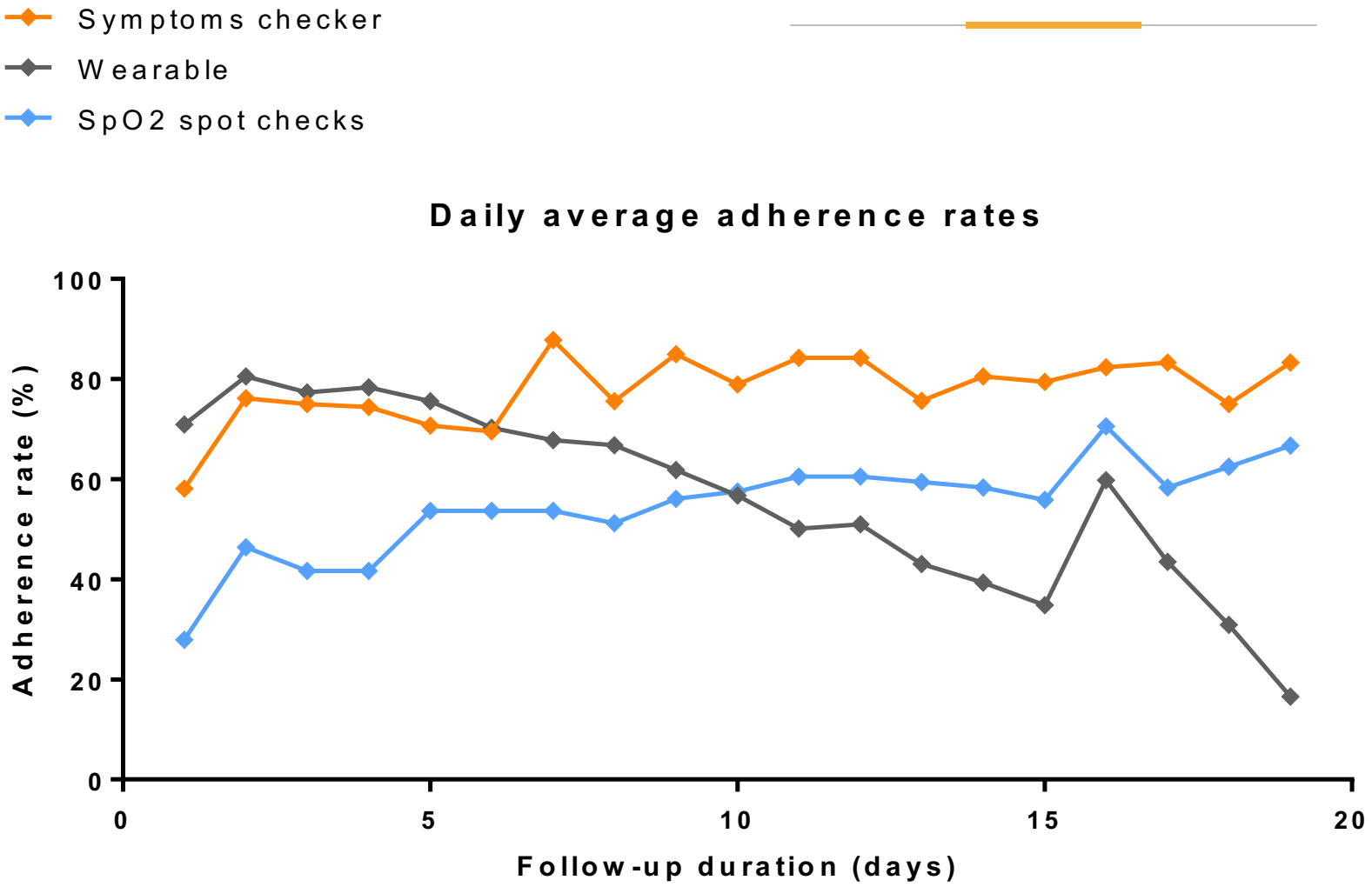
PATIENTS ADHERENCE



Cumulative adherence rates:

Symptoms Checker	73.9% [0-100]
Wearable	65.4% [2.6-96]
SpO2 spot checks	54.2% [0-100]

Adherence rates for symptoms checker and wearable are comparable to those observed in a similar study [Innominato et al., 2016, *JMIR*]

Daily adherence rates are presented as average for the 43 patients who provided data via the app and the 33 patients who used the wearable device

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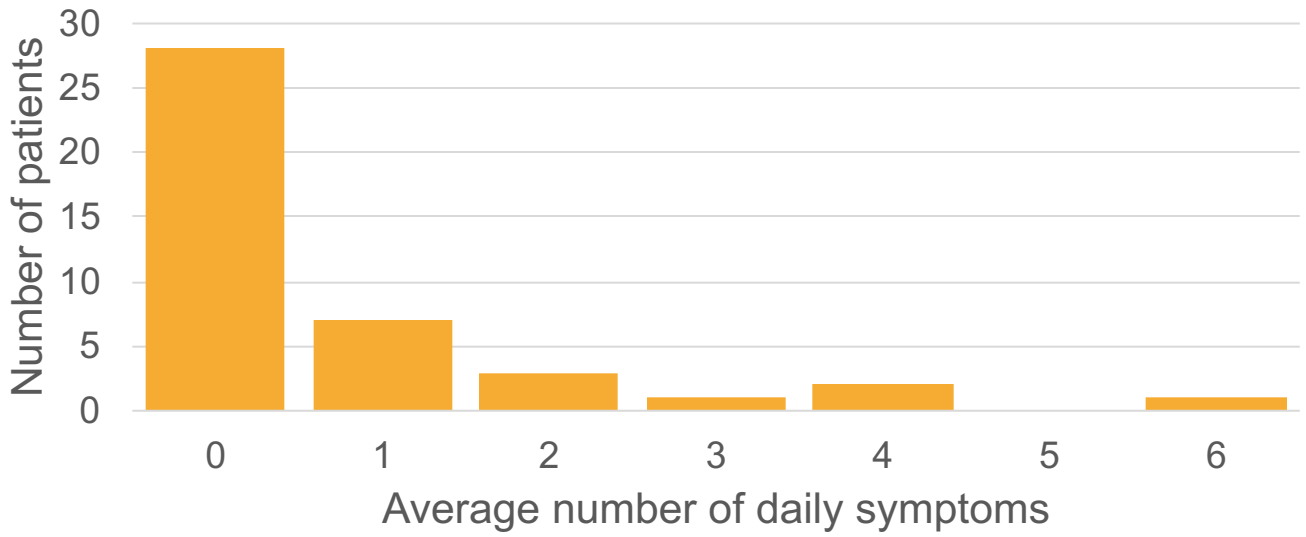
SYMPTOMS CHECKER SUMMARY (1/2)

Patients were prompted to answer to the Symptoms Checker twice a day initially. This was reduced to once a day after one week to reduce burden on patients.

A total number of 617 symptoms checkers were completed by 42 patients

(One patient did not complete any symptoms checker).



Average number of symptoms per day reported by the patients (N=42)

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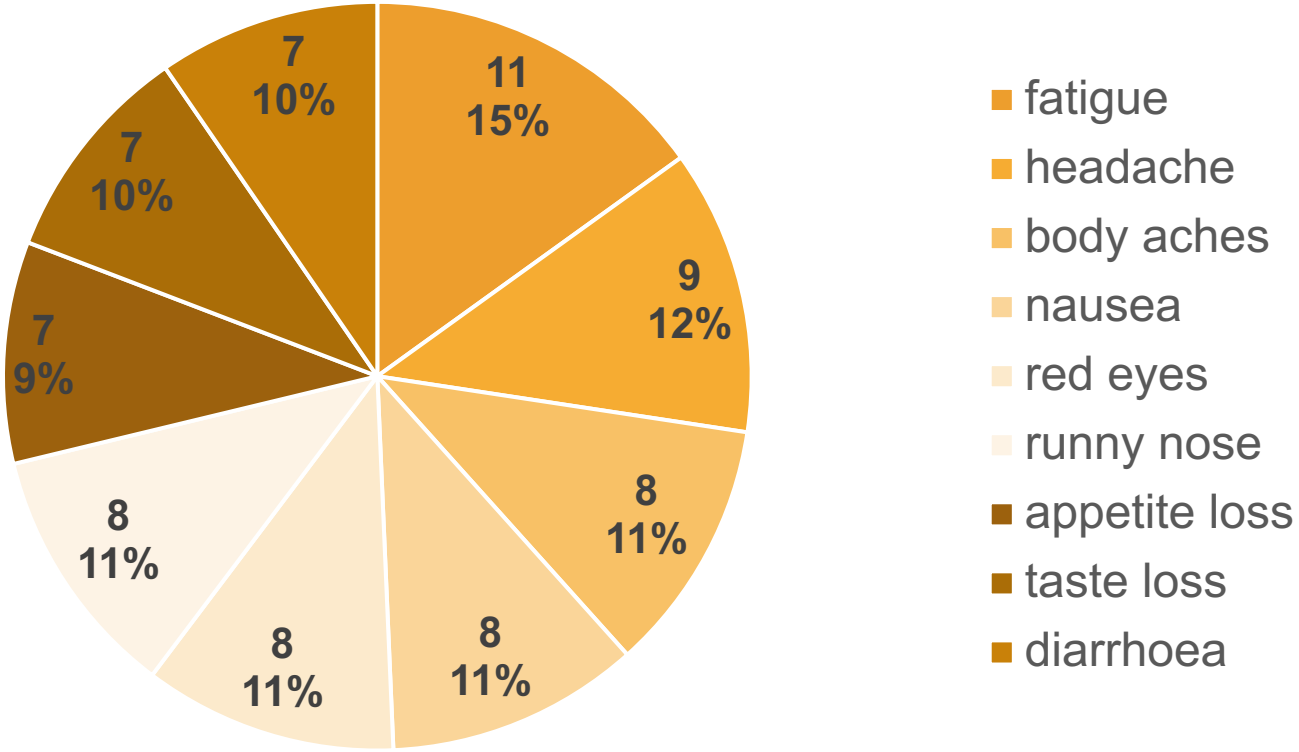
SYMPTOMS CHECKER SUMMARY (2/2)

Most common symptoms



Data are shown as number and proportion of patients who reported the symptom at least once.
Total number of patients = 42.

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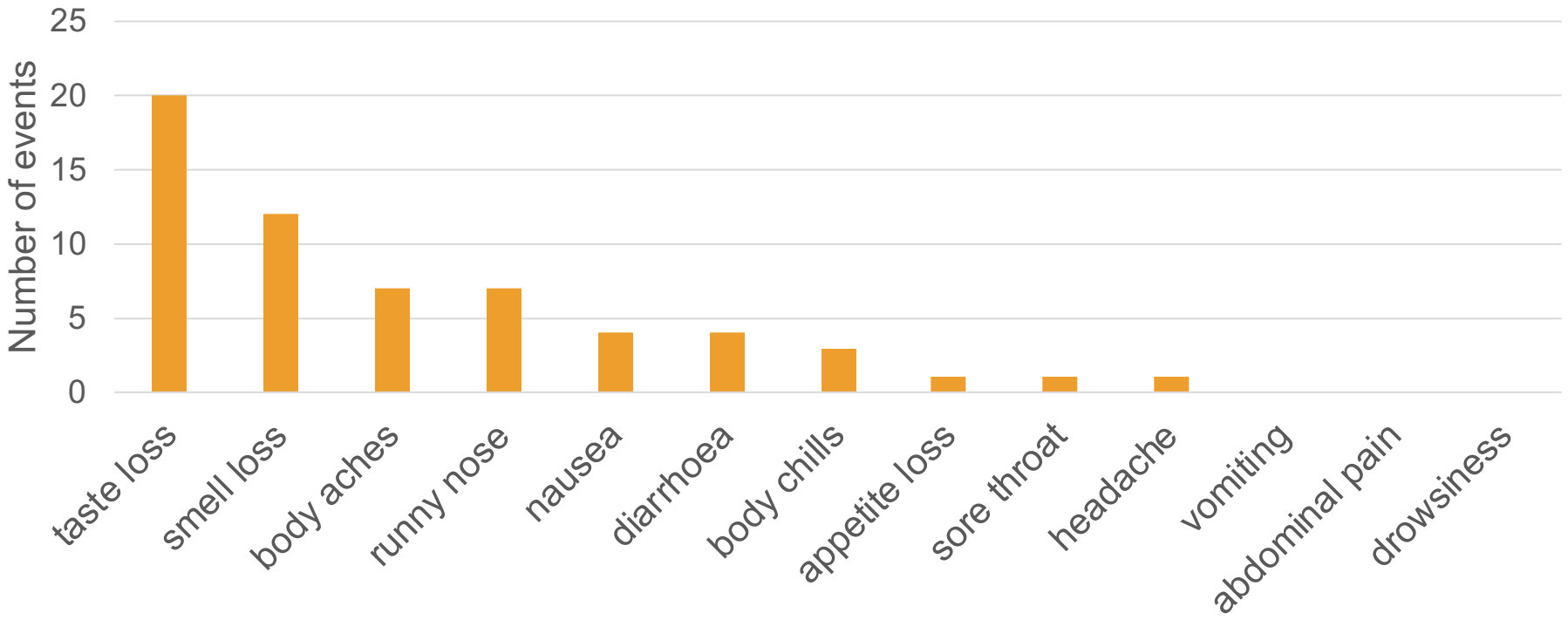
SYMPTOMS SPOT CHECKS SUMMARY

In addition to the daily symptoms checker, patients could input their symptoms as they occurred using the 'Events' module.

A total number of 35 symptoms were reported via Events by 7 patients



Number of events reported for the COVID-specific symptoms

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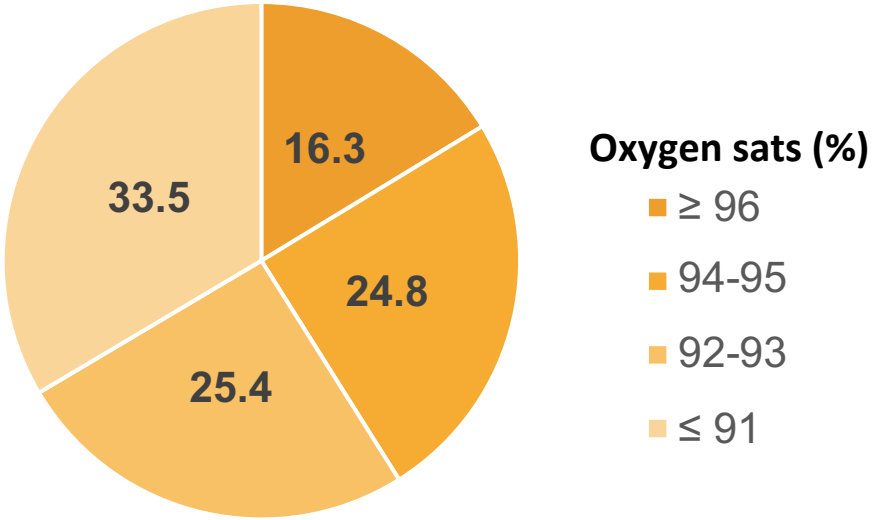
VITAL SIGNS SUMMARY – OXYGEN SATURATIONS (1/2)

Continuous oxygen saturations were measured at night with the wearable. Spot check, daytime readings were provided by the patients using the 'Events' module.
Night oxygen saturations were recorded in 27 (82%) patients.

Descriptive statistics	Oxygen saturations (%)
Average	92.5
Range	70 – 100
Median	93
25th , 75th percentile	91 , 95

Cumulative summary across the 27 patients



Proportion of oxygen saturations above, below or between thresholds according to the NEWS scoring system [*Royal College of Physicians. National Early Warning Score (NEWS) 2: Standardising the assessment of acute-illness severity in the NHS*]

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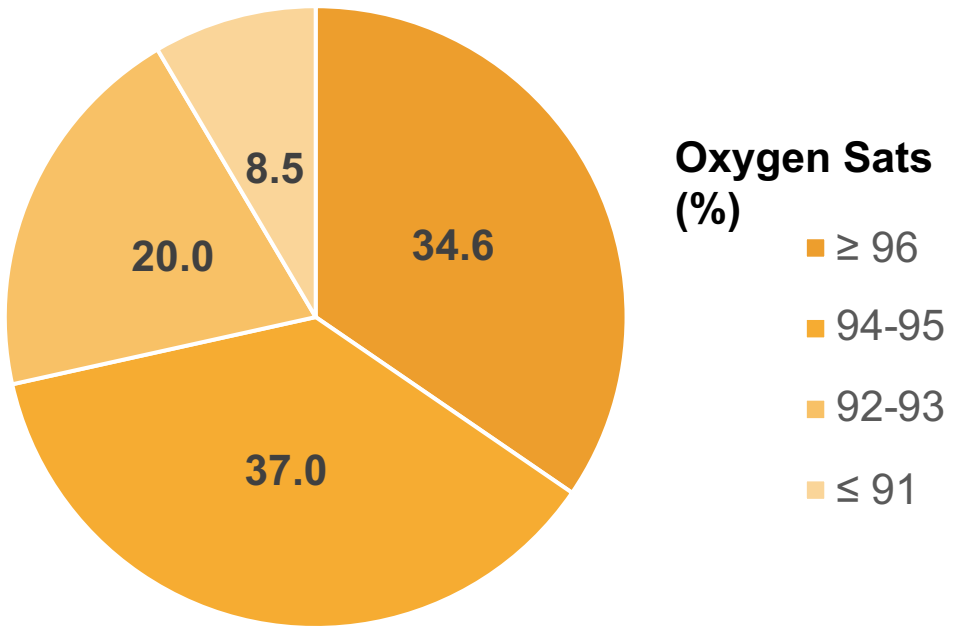
VITAL SIGNS SUMMARY – OXYGEN SATURATIONS (2/2)

30 (70%) patients reported a total number of 703 o2 sats spots checks.

Descriptive statistics	Oxygen saturations (%)
Average	95
Range	64 - 100
Median	95
25th , 75th percentile	93, 96

Cumulative summary across the 703 measures



Proportion of oxygen saturations above, below or between NEWS thresholds.

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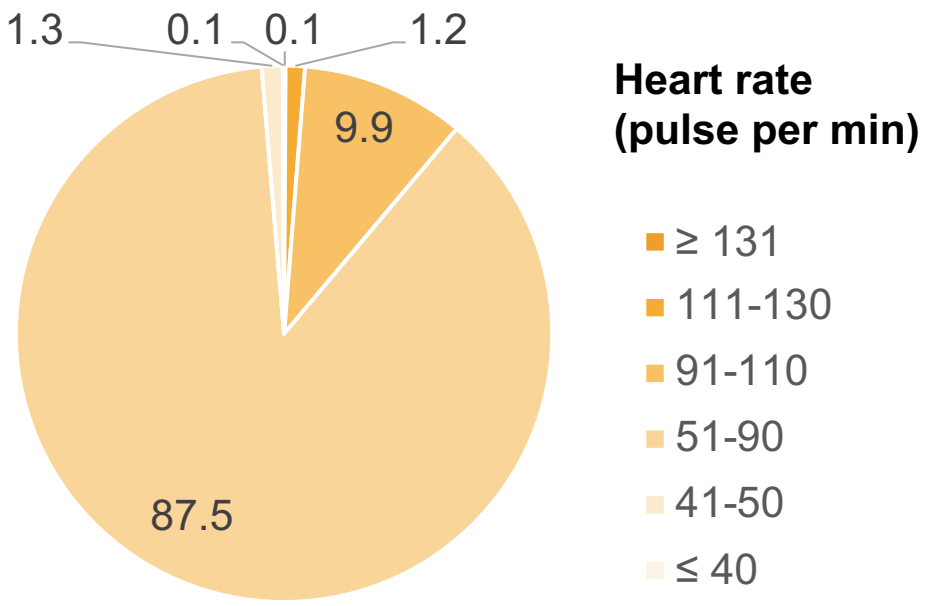
VITAL SIGNS SUMMARY – HEART RATE (1/2)

Continuous HR data were measured passively with the wearable. Spot checks were provided by the patients using the 'Events' module. Heart rate data were recorded by the wearable in 36 (84%) patients.

Descriptive statistics	Heart rate (Pulse per minute)
Average	72.7
Range	14 – 180
Median	71
25th , 75th percentile	63, 81

Cumulative summary across the 36 patients



Proportion of heart rate data above, below or between NEWS thresholds.

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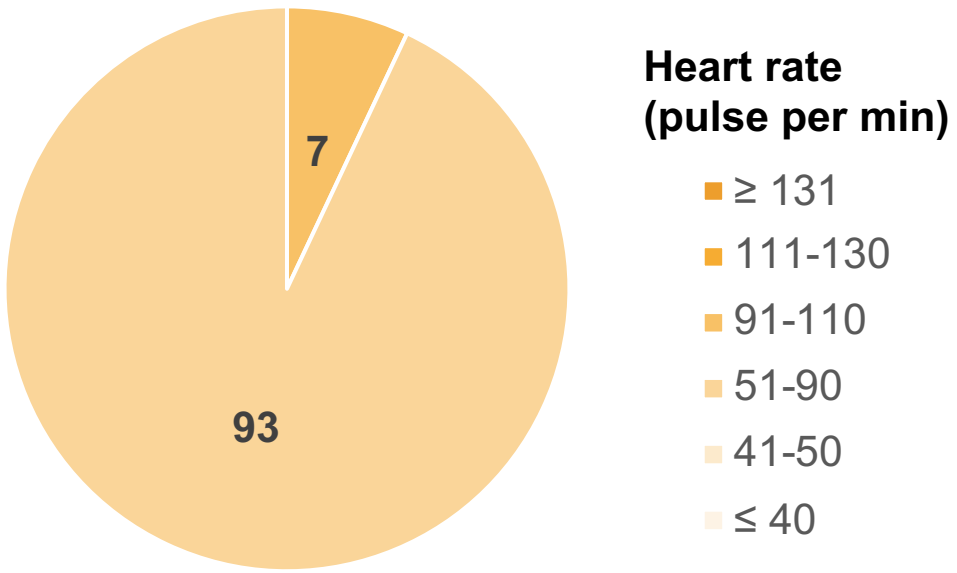
VITAL SIGNS SUMMARY – HEART RATE (2/2)

Eleven (26%) patients reported a total of 100 HR spots checks.

Descriptive statistics	Heart rate (Pulse per minute)
Average	76.4
Range	56 – 97
Median	76
25th , 75th percentile	72, 82

Cumulative summary across the 100 measurements



Proportion of heart rate data above, below or between NEWS thresholds.

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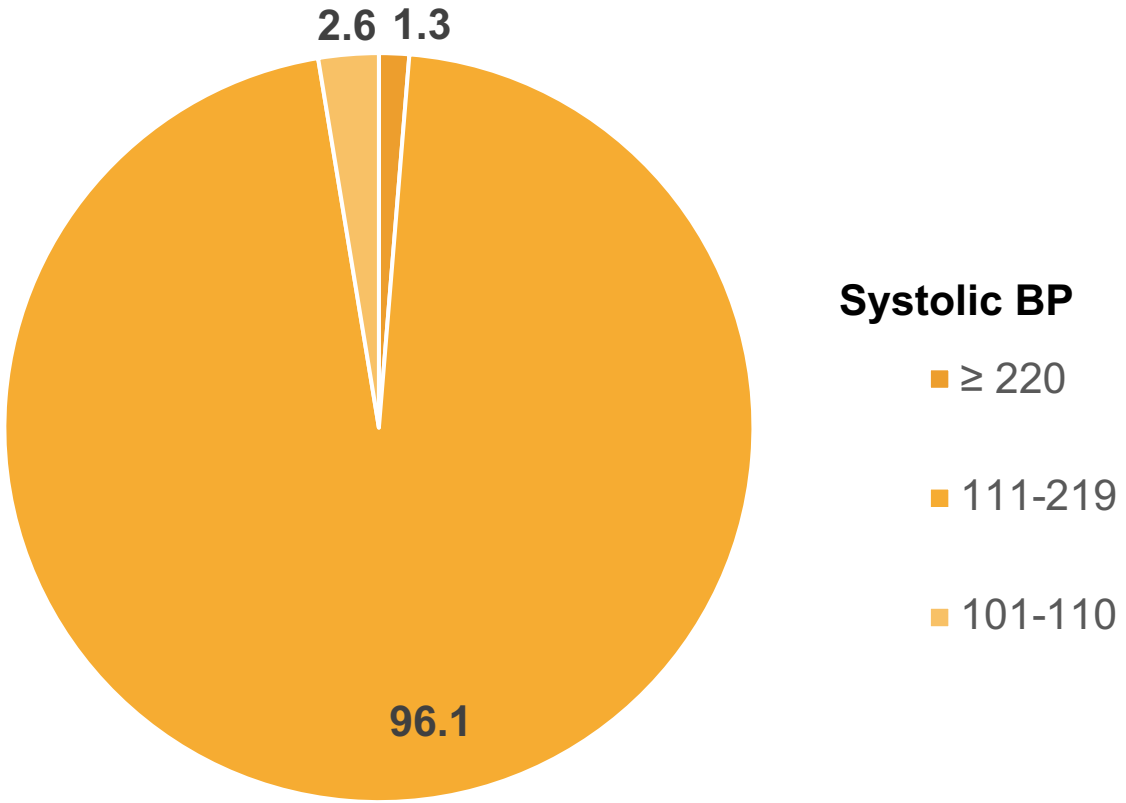
VITAL SIGNS SUMMARY – SYSTOLIC BLOOD PRESSURE

Five (12%) patients reported a total of 77 BP spots checks.

Descriptive statistics	Systolic BP (mmHg)
Average	131
Range	108 – 240
Median	129
25th , 75th percentile	122 , 137

Cumulative summary across the 77 measurements



Proportion of systolic blood pressure (BP) above or between NEWS thresholds

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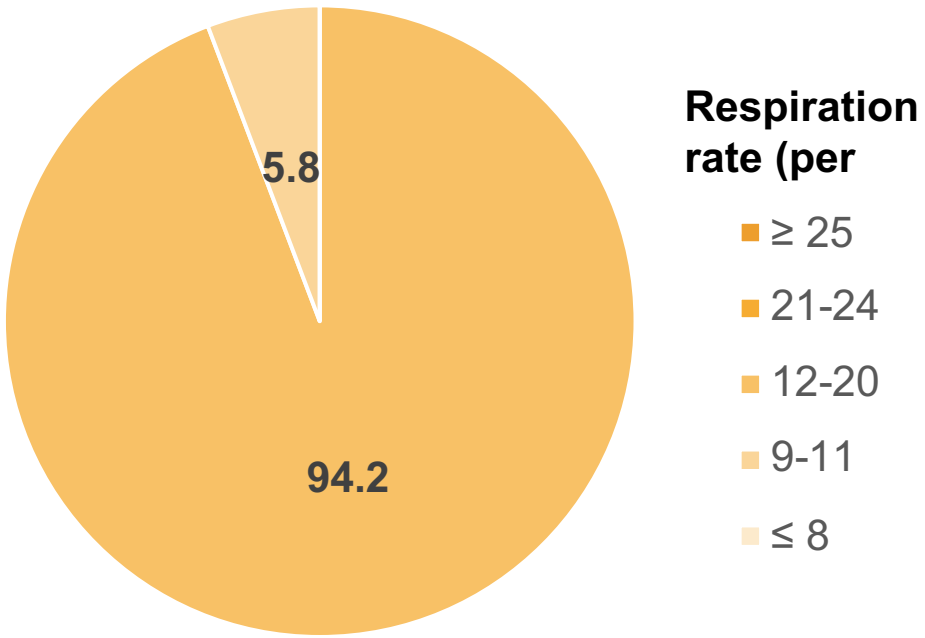
VITAL SIGNS SUMMARY – RESPIRATION RATE

Three (7%) patients reported a total of 52 respiration rate spots checks.

Descriptive statistics	Respiration rate (per minute)
Average	13.3
Range	10 – 18
Median	13
25th , 75th percentile	12 , 14

Cumulative summary across the 52 measures



Proportion of respiration rate data above or between NEWS thresholds

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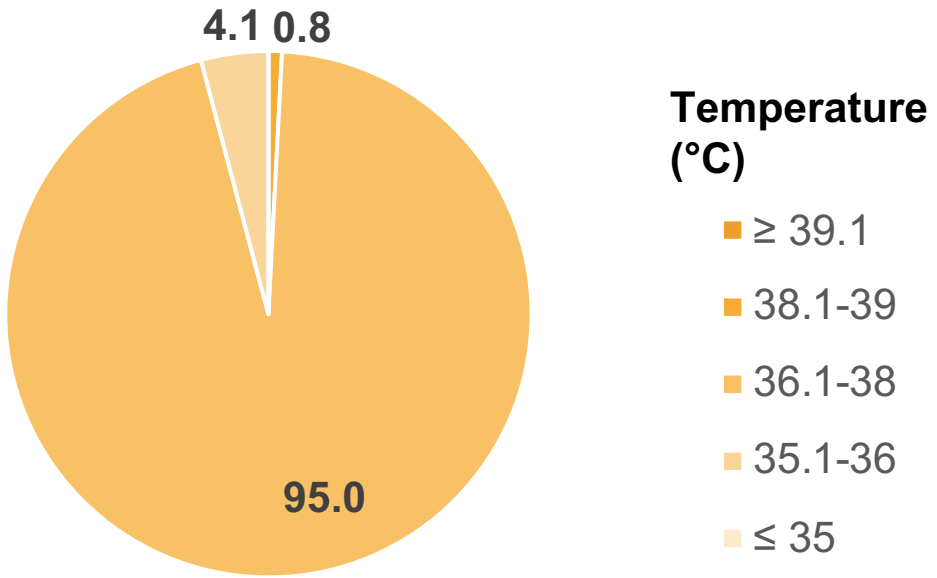
VITAL SIGNS SUMMARY – TEMPERATURE

Nine (21%) patients reported a total of 121 temperature spots checks.

Descriptive statistics	Temperature (°C)
Average	36.4
Range	35.3 – 38.8
Median	36.4
25th , 75th percentile	36.3, 36.5

Cumulative summary across the 121 measures



Proportion of temperature data above or between NEWS thresholds

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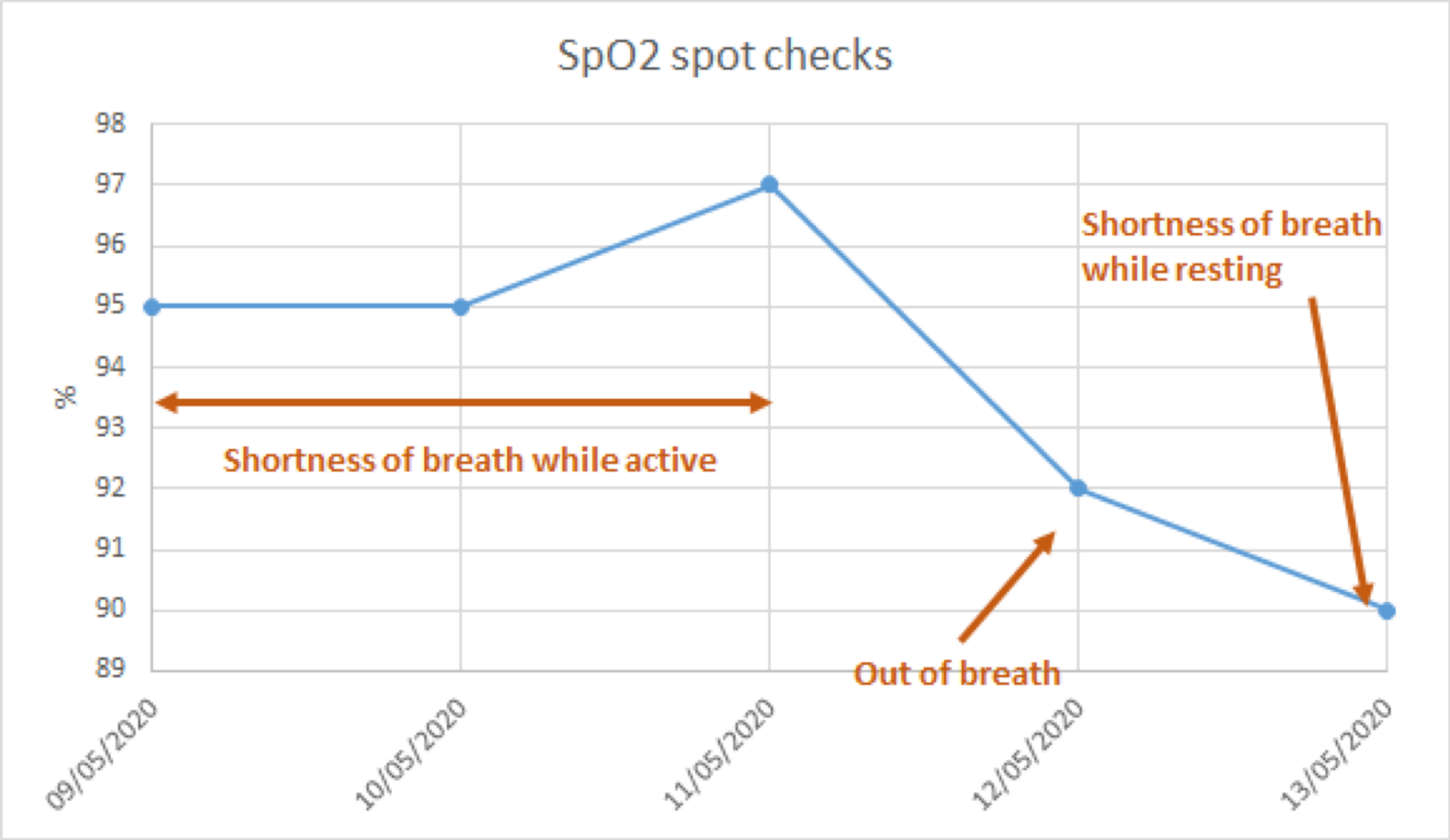
INDIVIDUAL PATIENT EXAMPLE

69 year old male data before he was admitted with an infection



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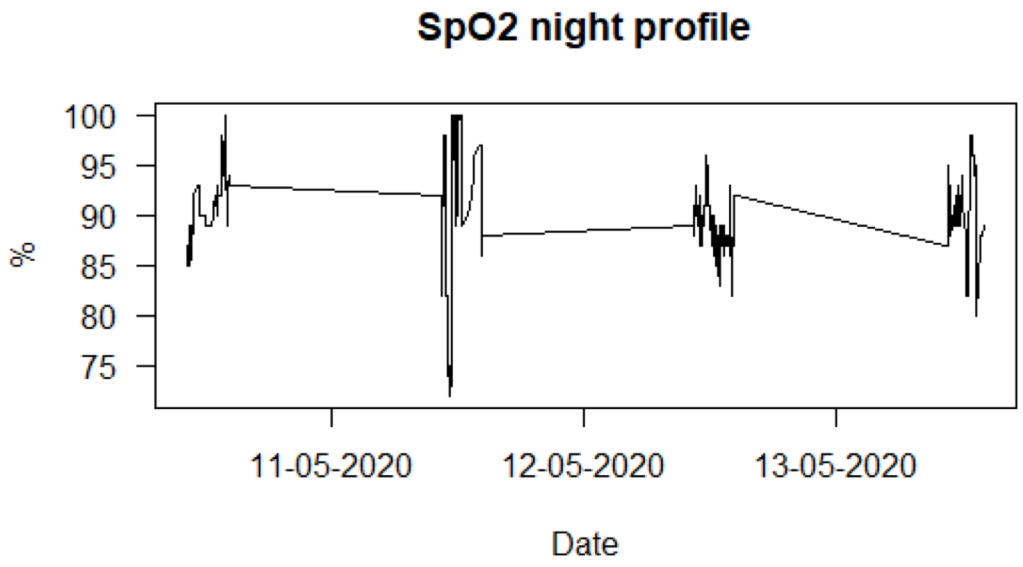
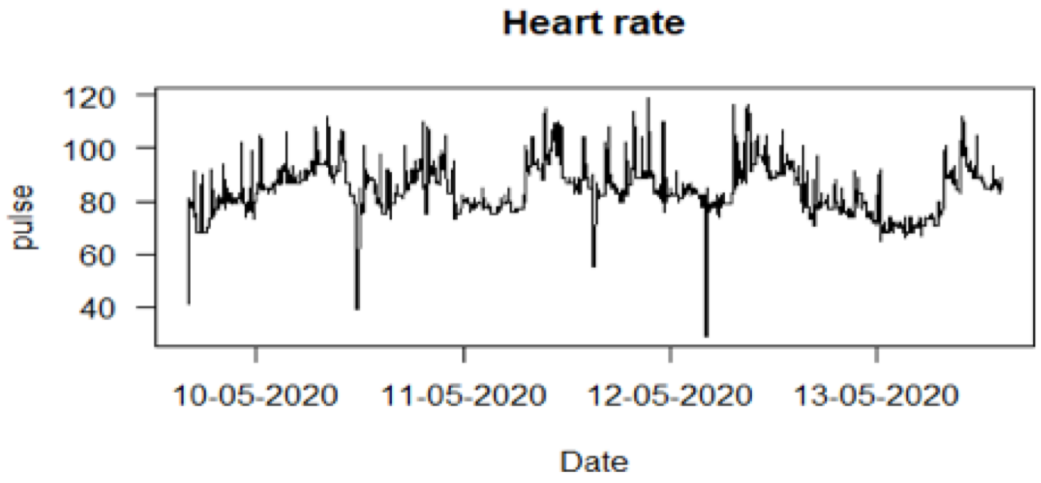
INDIVIDUAL PATIENT EXAMPLE

Longitudinal Oxygen saturations and heart rate before the patient was admitted – supporting future validation of data analysis to trigger clinical alerts





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SURVEY RESULTS (1/2)

A feedback survey was submitted to the patients recruited from the North Wales Patients Forum. 22 patients responded.
Overall the patients were satisfied by the app and the wearable and find them easy to use.

On a scale of 0-10 (0: not at all, 10: very much):

- how easy did you find the app to use: **average 8.3**
- how easy did you find the Garmin wearable to use: **average 6.9**
- how do you feel about using an app on your phone to share your symptoms with your Doctors: **average 9.3**
- how do you feel about wearing a wearable device like the Garmin one to share your vital signs with your Doctors: **average 8.7**

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SURVEY RESULTS (2/2)

What did you like or did not like about the app ?

"Easy use"

"It was clear and understandable."

"It was easy to navigate."

"Not being able to see data collected on phone"

"Had big problems connecting the Garmin watch with my phone."

"twice a day is too much."

What did you like or did not like about the Garmin wearable ?

"I found the Garmin comfortable to wear and very informative."

"Unobtrusive to wear. Forgot that it was there.

"Very easy to wear and use."

"Garmin device much too small and fiddly"

"The oxygen measure option would not always work. It would just show last reading without measuring for new reading.."

"very small display."

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IMPACT

This two week fesability study has demonstrated many key indicators that can now be deployed as aprt of the virtual clinical hub to be established in Ysbyty Gwynedd in the coming weeks.

- People benefiting – the tech will be configured to take on board the user feedback over the last two weeks and to maximise the patient benefit and ease of use by the clinical team.
- Health & care outcomes – improving patient outcome by utilisation of the data to identify early signs of clinical deterioration
- Economic outcomes – predicted to save on unnecessary outpatient clinical visits when not necessary
- Efficiencies in services – utilisation of clinical staff that can't work frontline for the monitoring of data via the virtual hub

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INPUT TO THE PROJECT - MEET OUR CLINICAL TEAM

CLINICAL TEAM AT YSBYTY GWYNEDD, BETSI CADWALDAR UNIVERISTY HEALTH BOARD

Dr Pasquale Innominato

Consultant Medical Oncologist

Dr Nicholas Wreglesworth

Medical Oncologist

Dr Chris Subbe.

Acute Medicine Consultant

Dawn Griffiths

Acute Oncology Nurse Practitioner

And 27 nurses that supported the recruitment and support, including the testing of the training site

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INPUT TO THE PROJECT - MEET OUR APARITO TEAM

Elin Haf Davies

Chief Executive Officer

Sandra Komarzynski

Data Scientist

Aleksa Vukotic

Chief Technology Officer

Changes in staff, management structure or personnel administering the project.

Sandra Komarzynski (data scientist) joined the team working full time on tracking the data.

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INPUTS TO THE PROJECT

BREAKDOWN OF ALL EXPENDITURE

Garmin devices and posting and packaging - £9000
Azure secure cloud hosting - £500
Aparito direct technical costs, including Welsh translations and integration - £5500
Aparito logistical and organisations support (training, phone support, training site, email support) - £7000
Aparito data analytics and future planning - £2000
ADiTech family support integrations - £1500
TOTAL £25,500

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LEARNINGS FROM THE PROJECT

PROCESS

Staff time extremely limited to set up. High enthusiasm and keen to explore offering the same solution to staff for their own health monitoring.
No wifi / 3G access in the hospital – so can't support patients on site.
Change o2 saturation rule and symptoms checker to minimise impact of data reporting on patients.

TECH

Three patients didn't have smartphones.
Patients need a lot of time to familiarizes – including a lot of encouragement and support – but they do get there.
Vivosmart4 face too small for them to see/read ("fiddly") . Consider larger wearables.
No patient data view on app means that patient's lose interest.
Including patient Forum input and feedback to from experience to date to define cancer specific and personalised experience

"their children monitor their devices and in lockdown they aren't seeing their children"

DATA VIEW

Offer patient view of data.
Develop clinical care dashboard to show data to doctors.

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NEXT STEPS

New cancer specific pathway now developed for deployment to support the differentiation for COVID and cancer symptoms

Integration of different wearable devices (e.g. larger ones) to match patient choice

Extended deployment as part of a virtual hub post COVID due to go live next week (including respiratory specific symptoms). Doctors tasked with designing the dashboard to support with clinical triage

Creating a new virtual hub and clinical pathway with allocated Doctors on rota to look at data and take action / follow up calls with patients

Introduction to cancer services In West of England from the AHSN as a result of the trial

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