Te Whatu Ora
Health New Zealand
Waitematā

Remote Patient Monitoring

Evaluation

institute for innovation + improvement

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Written By	Jo Barr – Project Manager, Institute for Innovation and Improvement Rosie Dobson – (Programme Manager (Research and Evaluation), Institute for Innovation and Improvement)

Contents

Executive Summary

This report presents the evaluation of a remote patient monitoring programme (RPM). The RPM programme was piloted with a cohort of patients under General Medicine (n=46) and Renal (n=18) services. The anticipated outcomes for the programme included; patient's increased awareness of their long-term condition and management, improved patient engagement, and support from, the medical teams, and improved health outcomes. It is anticipated that if achieved these outcomes could lead to reduced hospital length of stay and a reduction in readmissions.

Considering the goals of the pilot, the General Medicine service chose to select a cohort of patients who had very little follow up post discharge and were likely to represent to hospital with poorly managed heart failure (HF). The Renal service opted to pilot with a cohort of patients who were relatively stable, however, due to a long-term requirement to attend clinic appointments, they could be given the choice to either attend face to face or be managed remotely.

Feedback regarding the model of care for both services was overwhelmingly positive from both patients and clinicians. The programme provided education and support at a pace that allowed patients to understand their condition and its management, while also providing a sense of being connected to the health system during a time when there was uncertainty about their recovery. A holistic approach to the service provided better connection to GP practices and interventions that resulted in reduced readmissions for non-HF reasons. Clinicians regular access to a patient's data to allow prompt support, intervention and guidance.

While the feedback for the model of care was positive, it was clear that the digital platform piloted was not at a stage where it could function at scale and in its current state was not fit for purpose. Further there is significant risk of increasing inequities due to digital literacy and confidence (particular in the older cohort), and access to required devices and data/internet. There was significant technology burden for both patients and clinicians resulting in an inefficient, labour intensive workflow. The piloted product requires a lot more work to be reliable and user friendly. A review of alternative products should be considered to assure reliable data availability, usability for both patient and clinicians, and be a product to support the service rather then an increase in burden. A poorly functioning product will limit any success in an RPM programme.

In conclusion, the remote patient monitoring pilot demonstrated significant promise in improving patient engagement, and enhancing the management of long-term conditions, and received positive feedback from both patients and clinicians within the General Medicine and Renal services. The program effectively provided education and support, fostering a deeper understanding of patients' conditions and promoting a sense of connection to the healthcare system, particularly for those recovering from illness or managing chronic conditions.

Moving forward, it is imperative to review and invest in a platform that has been developed and refined to ensure it can function efficiently at scale. Efforts should be directed toward resolving the identified issues and streamlining the workflow for both patients and clinicians. By addressing these challenges along with ensuring the technology is user friendly and accessible to all, we can unlock the full potential of remote patient monitoring, leading to improved healthcare outcomes, reduced hospitalisations, and ultimately enhancing the quality of care delivered to patients.

Background

Remote patient monitoring (RPM) enables monitoring of patients outside of conventional clinical settings, such as in the home or in a remote area, which may increase access to care, improve quality of life and decrease healthcare delivery costs.

Heart failure (HF) (within General Medicine) and renal services had existing remote monitoring models of care at Waitematā, which provided patients with monitoring equipment upon discharge or at their first clinic appointment. Data would then be sent over email or collected over the phone in a manual, inefficient and unstructured way which often did not meet the needs of the patient or the service.

To address this, Waitematā decided to develop and test an RPM programme to improve the transition of care from hospital to home for HF and renal patients. The components of programme included:

- Dedicated RPM clinical nurse specialist (CNS) resource.
- A digital remote monitoring platform with clinician and patient portals, which allows for clinicians to review and manage patients remotely using real-time data collected via Bluetooth-enabled devices.

The programme logic diagrams for the HF and renal RPM programmes showing the planned inputs alongside anticipated outputs and outcomes can be seen in Figures 1 and 2 respectively.

Figure 1: HF programme logic diagram.

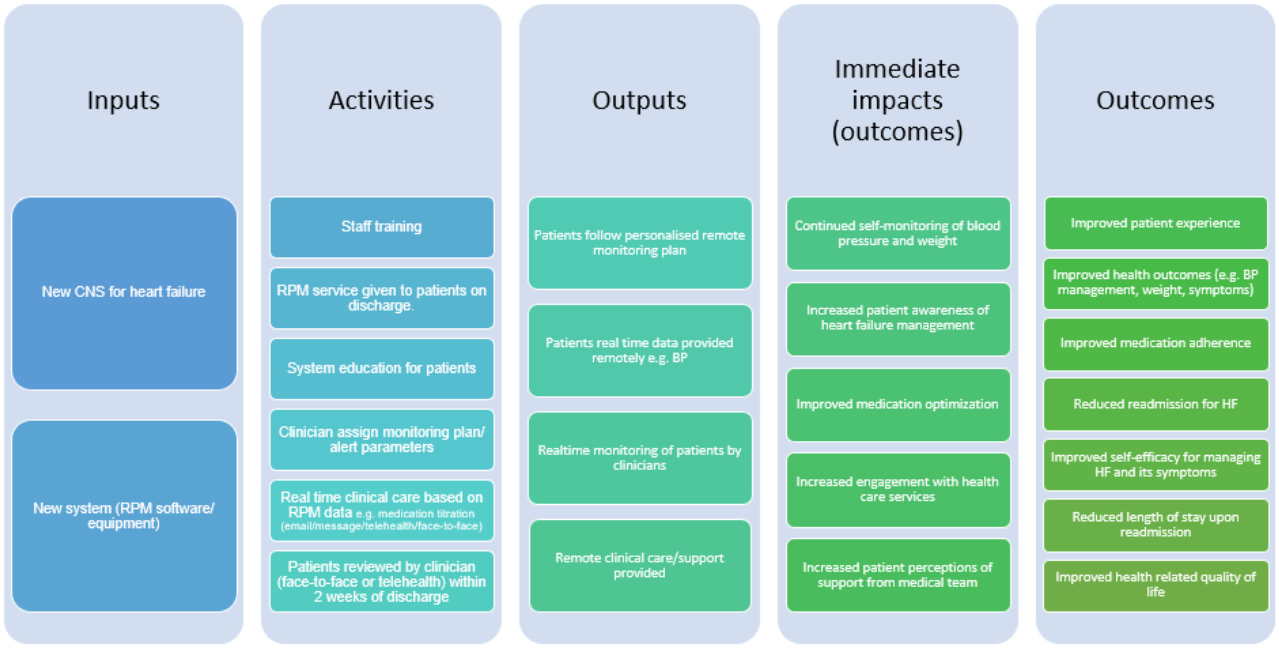
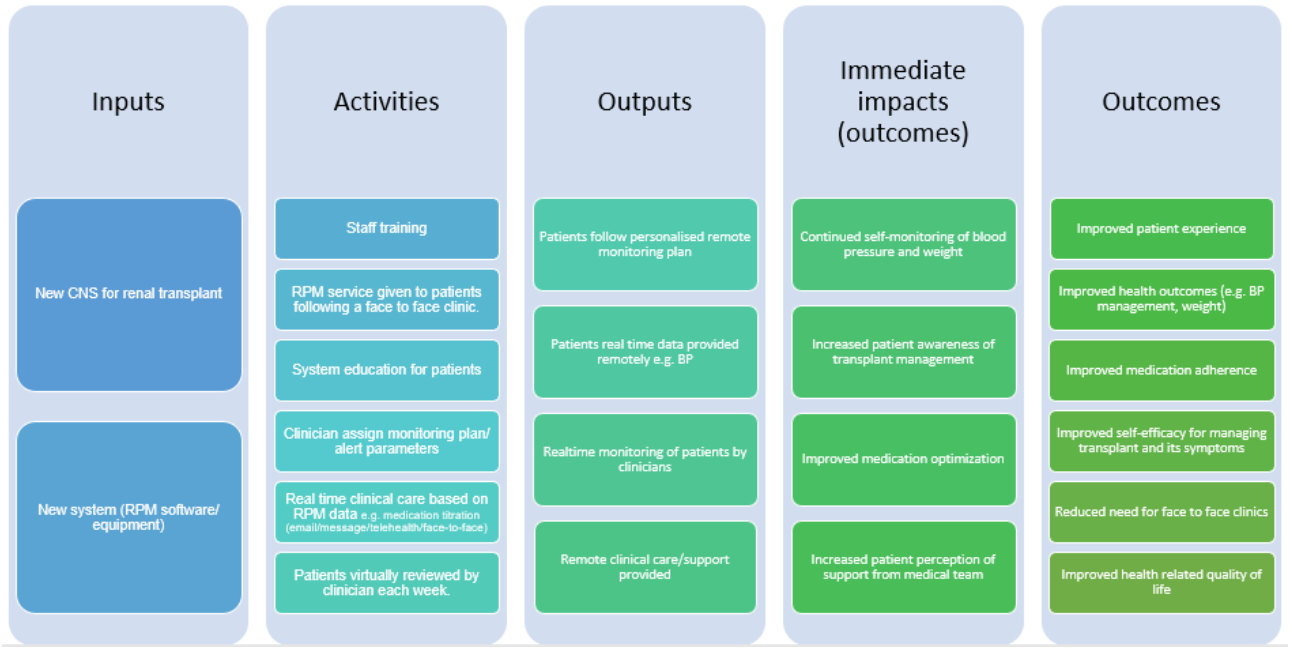


Figure 2: Renal programme logic diagram.



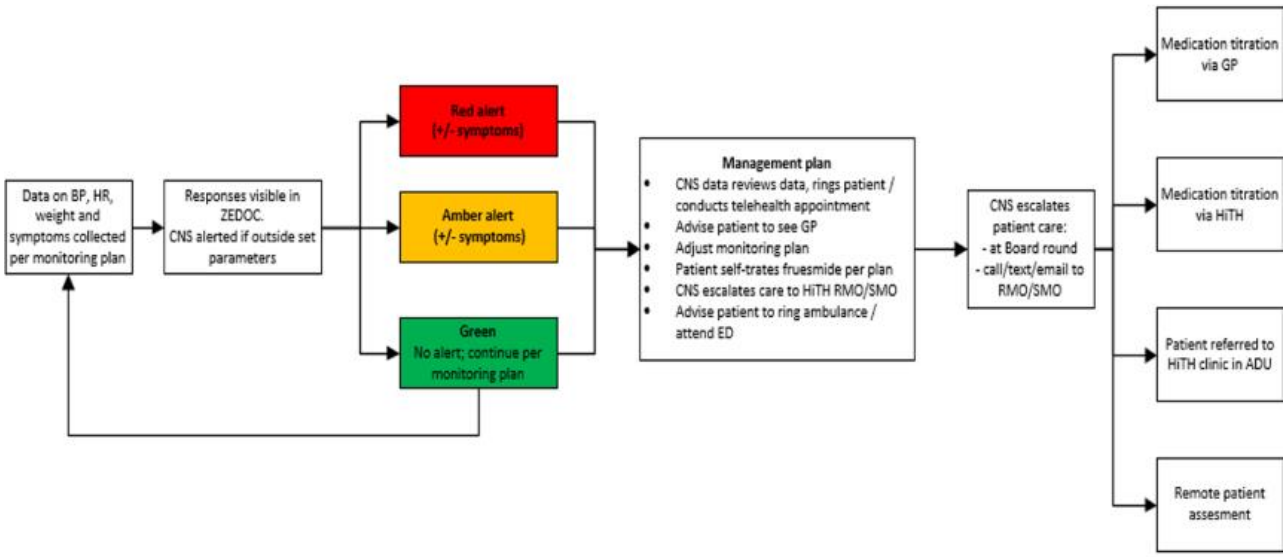
Proof -of-concept methods

A proof of concept (POC) to test the RPM programme was carried out between 2022 and 2023. The aim of the POC was to evaluate the feasibility and acceptability of the RPM model of care, for General Medicine patients with a HF diagnosis and post-renal transplant patients.

Heart Failure

The Cardiology and General Medicine teams identified a gap in the system for patients who were diagnosed with HF and remained under General Medicine. This cohort would be discharged from hospital to the care of their GP with limited medical follow up, often resulting in readmission. Therefore, the group decided to focus on this cohort for the POC. The model of care used for HF is outlined in Figure 3.

Figure 3: The model of care used for HF



Sample

The HF eligibility criteria and exclusion criteria are summarised in *Picture 1.*

[1] **Eligibility criteria**
- Under General Medicine specialty
- Acute decompensated heart failure requiring IV diuretics in hospital and optimising of fluid status
- Prior heart failure admission within the past year
- Maori/Pasifika preference
- Rural patient preference
- Age over 18 years old
- Waiting > 3 months for a Cardiology outpatient appointment.
- Speech, vision or cognitively impaired with carer support
- English is non dominate language with carer, Pacific or Maori health support.

[2] **Exclusion criteria**
- Significantly impaired hearing ability.
- Resident of long-term care facilities
- Participating in another clinical trial
- Haemodialysis (home-based or facility-based)
- Under care of renal service for remote monitoring
- Life expectancy less than 1 year
- Speech, vision or cognitively impaired with no carer support.
- English is non dominate language with no carer support.

(Picture 1 - Inclusion and exclusion criteria as of March 2023)

Data from the Cardiology Qlik dashboard was used to create a specific RPM dashboard to identify potential patients who met the eligibility criteria. When no patients were visible in the RPM dashboard the CNS would clear the inclusion criteria and review all patients on the Cardiology dashboard to pick up any missed patients. During the POC there were periods where there was a delay in the uploading of data into Qlik from the data warehouse. When this occurred, the CNS would use a manual process of printing Trendcare and ward list data, followed by a review of individual patient's admission reason.

As the POC progressed it was clear that the programme would struggle to enrol the target sample of 60 patients with the current inclusion criteria. Therefore, the criteria were amended to include

cardiology patients who had waited more than 3 months for either a HF Nurse clinic appointment, Cardiologist appointment or a cardiology investigation i.e. ECHO appointment.

Increased clinical oversight/ patient engagement.

The digital platform is designed to send a variety of milestones and reminders to the patient. The daily monitoring programme, used for all patients enrolled, sent one monitoring AM milestone to patients each morning followed by a text reminder if not complete by 11am. The AM milestone allowed patients to either manually enter their BP, HR and weight readings or pair their Bluetooth BP machine to auto populate their BP and HR. Once the readings were complete the patient was required to answer several questions about their current symptoms or a change in symptoms. If a patient's readings were not completed by 16:00 the milestone would expire, and the patient would no longer be able to access it to input data. As a part of the programme a week 1 and 2 check in survey was scheduled. The survey gave patients the opportunity to raise questions they may have regarding their medications and/ or condition. On day 14 and 21 in the programme, education material from the Heart foundation were sent via the platform. Below is a list of milestones used for the HF programme:

- AM daily milestone – automatically sent each day allowing data input between 07:00 – 16:00.
- R milestone – a standalone milestone replicating the AM milestone, which the CNS could manually trigger.
- Week 1 check in – automatic survey sent to the patient in week 1 of the programme.
- Week 2 check in – automatic survey sent to the patient in week 2 of the programme.
- Education material day 14 – Heart Foundation staying well education video.
- Education material day 21 – Heart Foundation daily recording education video.
- Exit questionnaire – feedback survey sent to the patient at time of discharge.

A milestone was regarded as complete when; vital readings and symptoms questions were answered, check in questions answered, educational material opened and viewed, or survey questions answered. Completion was then recorded in the data as a response.

Clinician Response and Intervention

Baseline parameters were agreed upon as a guideline (below). These parameters were reviewed with the medical team at enrolment and could be updated based on the patient's condition.

- Systolic blood pressure:
  91 - 120 = Green
  90 or >150 = Orange
  80 or >160 = Red

- Heart rate:
  50-90 = Green
  45 – 49 or >100 = Orange
  <45 or >110 = Red

- Weight:
  No change = Green
  1kg increase or 1kg decrease = Orange
  2kg increase or 2kg decrease = Red

Green required no further attention or response from the CNS and no alert was generated. Orange alert resulted in closer monitoring and review of trends by the CNS and presenting at the weekly

Hospital in the Home (HiTH) board round, if necessary. Red alert would trigger a phone call from the CNS and escalation to the HiTH SMO to discuss an action plan which included; medication titration, review in ADU clinic, review by GP etc.

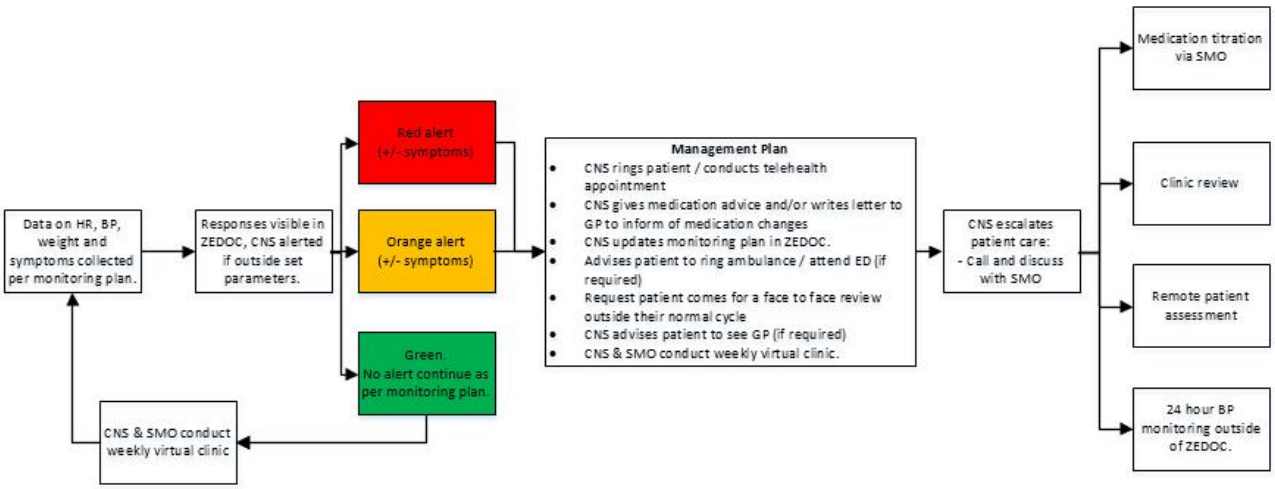
User feedback

In addition to system recorded data the HF POC was evaluated through patient and clinician questionnaire to assess acceptability, feasibility and impacts of the programme. Once a patient was discharged from the programme an exit questionnaire was sent to them via the digital platform. For patients who did not initially complete the questionnaire every effort was made by the CNS to follow up and support them.

Renal

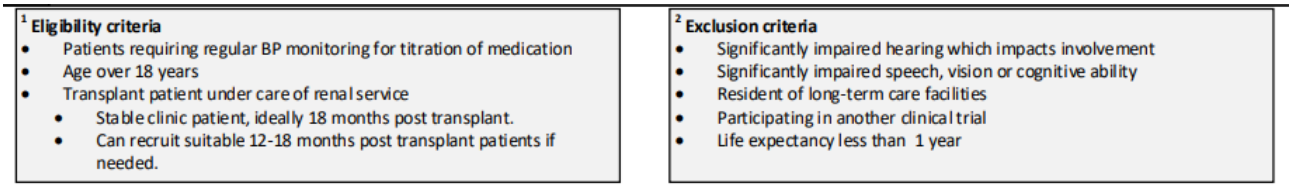
For the renal service it was decided through collaboration between the service and the project team that the cohort for the POC would be patients who were 18 months post-transplant, that were relatively stable and routinely attended three monthly face-to-face clinics. The model of care for renal is outlined in Figure 4.

Figure 4: Renal model of care



Sample

The eligibility criteria and exclusion criteria are summarised in *Picture 2.*



(Picture 2 - Inclusion and exclusion criteria December 2022)

The SMO and CNS worked through a current list of approximately 100 patients who were 12 months post-transplant, to identify which patients met the above criteria. The CNS then contacted the patients who were identifies as suitable for the pilot and asked if they wished to take part.

Due to challenges with the platform in the HF pilot it was decided to not enrol patients who were over 70 years old, as there was a requirement for the patient or their caregiver to troubleshoot technical issues.

The Renal POC was approved for 40 patients, as these patients could be identified quickly and likely enrolled simultaneously, we decided to start with only 10 to prevent overloading ZEDOC, as they had only experienced 1-2 enrolments a week previously.

Increased clinical oversight/ Patient Engagement

The renal programme had routine milestones set up, like HF. The monitoring regime for Renal was less intense than HF as these were stable post-transplant patients who remained in the community with very few needing to be admitted to hospital. However, good management of their BP would increase the life of their transplant and prolong or remove the need for future dialysis.

Milestone used for the Renal programme included:

- Weekly milestone – automatically sent weekly allowing data input between 07:00 – 16:00 on the day the milestone was sent.
- Monthly milestone – automatically sent monthly allowing data input between 07:00 – 16:00 on the day the milestone was sent.
- R milestone – a standalone milestone, which the CNS could manually trigger to allow readings to be recorded outside their monitoring regime.
- PC milestone – pre clinic milestone designed to assess a patient's symptoms and understanding of medications prior to their clinic appointment.
- Exit questionnaire – feedback survey sent to the patient at time of discharge.

As with HF, a milestone was regarded as complete when; vital readings and symptoms questions were answered, pre clinic questions answered or survey questions answered. Completion was then recorded in the data as a response.

Clinician Response and Intervention

Parameters were set for Renal to indicate when a patient's readings were; Green – no action required, Orange – closer monitoring and Red – phone call to patient and escalation to SMO. Set parameters outlined below:

- Systolic blood pressure:
  105- 140 = Green
  85 - 104 or 141- 180 = Orange
  <85 or >180 = Red

- Heart rate:
  50-100 = Green
  40 – 49 or 100 - 115 = Orange
  <40 or >115 = Red

- Weight:
  No change or <2kg = Green
  2-3.5kg increase or decrease = Orange
  >3.5kg increase or decrease = Red

User feedback

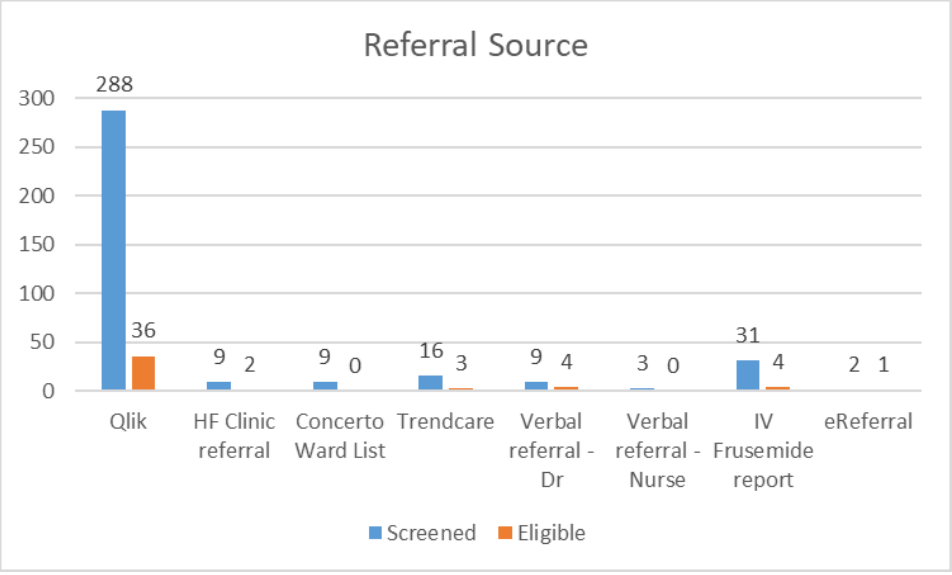
In addition to system recorded data the HF POC was evaluated through patient and clinician questionnaire to assess acceptability, feasibility and impacts of the programme. Once a patient was discharged from the programme an exit questionnaire was sent to them via the digital platform. For patients who did not initially complete the questionnaire every effort was made by the CNS to follow up and support them.

POC Evaluation Results – HF

Sample

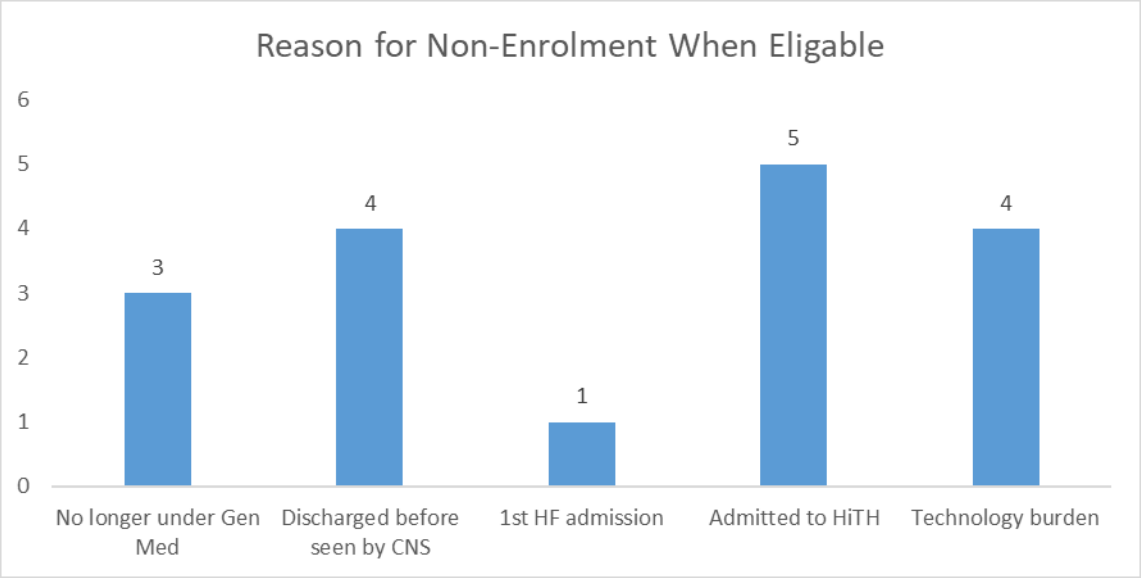
A total of 388 patients were identified and screened during the POC period (August 2022 to August 2023) and of these 15.4% (n=60) were found to be eligible for RPM. A breakdown of the referral sources can be seen in Figure 5.

Figure 5: Eligible patients by referral source.



Of the 60 patients identified as eligible for the RPM programme, 75% (n=45) progressed to enrolment. Reasons for not enrolling when eligible are detailed in *Figure 6* below.

Figure 6: Reasons for non-enrolment.



There was a total of 45 eligible individuals for the HF POC of which three were readmitted to RPM a second time following a hospital admission shortly after their first RPM discharge date. These patients have been counted twice in the data as they had two separate enrolments into the programme. Therefore, overall there were a total of 48 enrolments in the HF POC. The cohort of patients had a mean age of 78 years and 61% (n=28) were male. A total of 32% (n=15) were Pākehā/ NZ European, 30% (n=14) were Māori, 6% (n=3) Pacific peoples, and the remining 32% (n=15) were of other ethnicities.

Patient engagement

The overall response rate for the programme was 70.8%.

The response rate for the AM monitoring milestone was 66.8% and was impacted by several factors out of the patients control. These included:

- Outages in the system, which resulted in all patients not receiving their milestone.
- Milestones expiring before the patient was able to complete.
- Individual patients experiencing episodes of no milestones received.
- Readmitted to hospital.

At the start of the POC the AM milestone expired at 14:00. This allowed the option for twice daily monitoring. However, the twice daily pathway was not used, therefore, the PM milestone was removed, and the expiry time extended to 16:00, to align with the CNS's hours of work.

The response rate for the education material was 66.7% for day 14 and 66.7% for day 21. In March 2023 the timing of the education milestones was changed from day 7 and day 14 to the current schedule. This was aiming to improve the response rate as it was perceived that day 7 was too early and the patient was still getting used to the monitoring programme and day 14 coincided with some patients being readmitted and missing the milestone. Another potential contributing factor was the timing of the milestone being sent, as it was scheduled at the same time as the AM milestone and the patient may have been overlooked the additional notification.

Clinician Response and Intervention

During the POC, 2,546 alerts were generated of which 66.8% were for a change in weight, 2.27% were for a change in heart rate and 8.28% were for a change in BP. The remaining 21.7% accounted for new or worsening symptoms.

Improved Patient Outcomes

Of the 48 patients enrolled into RPM, 27% were readmitted within 30 days for a non-HF reason and 20.8% were readmitted with HF.

Communication and escalation to a patient's GP was required in 70.8% of the RPM patients. Reasons for escalation to a GP are listed below. Each communication with a GP often resulted in a request to follow up on a number of the reasons.

- 38.2% was to expedite a GP appointment.
- 79.4% was to inform of medication changes or a review of medications.
- 61.7% requests to review of blood results.
- 52.9% requests to review of fluid management.
- 61.7% included an update on a patient condition.
- In one instance escalation from the RPM CNS resulted in a GP conducting a home visit

Case studies

Case 1: Furosemide prescription

Mr G an 85-year-old male, living with his wife in an independent apartment, enrolled into RPM for ongoing HF management and was prescribed furosemide twice daily. Mr G had several falls over night during a short space of time while mobilising to the toilet, 2 falls lead to hospitalization. The RPM CNS reviewed Mr G's medication then inquired how he took his pills, he informed her he had medication for the morning - he took these with breakfast, lunchtime medications were taken with lunch, he described one pill he took in the evening after dinner. Mr G's medications were blister packed, on further investigation and going through the list with Mr G it was noted the medication blister packed for the evening was furosemide. The CNS followed up the incident with his usual pharmacy and was informed that they had blistered the medications according to the script they had received from hospital, they had not sought to clarify why furosemide would have been prescribed this way. The pharmacist agreed to change the furosemide to one in the morning and one at lunch time. Mr G did not have further falls after the medications were amended, he was thankful of the RPM team for noticing this error.

Case 2: Chronic UTI's

Mrs R, aged 91 years, enrolled into RPM for heart failure management post-acute discharge. It was identified she had experienced ongoing UTI's since 2018, regular urine and culture samples had been done, UTI's were all managed with oral antibiotics by her GP and in hospital, Mrs R was also prescribed UTI prophylaxis medication. Mrs R lived with her son, he stated his mum's 's recovery and wellbeing were affected by the UTIs. In Mrs R's case she would be prescribed

antibiotics; on completion; three or four days later she would report dysuria and new onset UTI. A GP communication had been sent requesting review of the prophylactic medication and best management for the UTI's. Further discussion with the HiTH SMO noted that Mrs R had become resistant to certain antibiotics a referral to the WDH Infectious diseases would be beneficial. The ID SMO in his response noted that some of Mrs R's UTI's had been managed with medications she was resistant to hence frequent recurrence, a recommendation of an antibiotic and prophylactic medication was made, the ID SMO made a recommendation for a vaccine to prevent UTIs.

Case 3: Empagliflozin

Mr W, who was in the care of the service for ongoing heart failure management was noted to have high creatinine levels and declining kidney filtration rate despite not increasing HF medications. Following a review and assessment of his medications it was noted he had been prescribed empagliflozin, a medication prescribed to manage type 2 diabetes and prolonging life in people with HF. After a discussion with Mr W and his wife they stated he was not diabetic, however, it was explained that the medication was prescribed for prolonging life and management of HF. Mr G and his wife didn't understand, Mr W had been in and out of hospital and this medication was never discussed with them, they were self-funding empagliflozin. On further discussion and investigation with the HiTH SMO, it was noted that Mr W did not meet the criteria for this medication and had been prescribed it 2-3 years ago with an already declining kidney function. Empagliflozin was with-held with a recommendation to discontinue by the HiTH SMO, Mr W's GP subsequently discontinued empagliflozin because Mr W was not benefitting from it.

Case 4 Elevated SBP's

Mrs S (64 years old) had been enrolled to RPM due to recurrent hospital admissions related to exacerbation of HF, she was on multiple medications for management of high blood pressure. Due to English being a second language most communication was with her 26- and 13-year-old sons. While in RPM her daily blood pressure measurements continued to increase until they reached over 200mmHg. The RPM CNS requested Mrs S's husband to take her to ED or their GP - they agreed but never did on multiple occasions, Mrs W was then referred to Pacifica services for ongoing support.

On further investigation, it was noted Mrs S had not been taking her BP medications for a long while The CNS phoned her usual pharmacy and was informed, she had not picked up scripts since 2021, her scripts had been transferred to another pharmacy. The CNS followed up with the new pharmacy and was informed the medications had been delivered to an address, which the family no longer lived at. Her care had also been moved to a new GP within the same practice where she had been lost to follow up and no face-to-face appointments arranged. The CNS managed to arrange a face-to-face appointment; however, Mrs S had declined to attend the appointment. Her condition was worsening, her latest script had been delivered, however, she was only taking her potassium replacement. Mrs S's GP agreed to do a home visit, she was immediately sent to the emergency department. Mrs S was subsequently discharged from RPM to her GP due to difficulty and lack of communication in following her up, her GP would do regular home visits and Pacifica Health was available to provide ongoing support whenever needed.

Patient Feedback

There were 48 questionnaire invitations sent out, 15 via the no-app link and 31 via the app. A total of 31 questionnaires were completed (completion rate 68.9%). Of those that completed the questionnaire 10 (32.3%) were female. The majority were Pakeha (n=11; 35.4%) or Māori (n=9; 29.0%).

All participants reported that they found RPM programme useful (n=31; 100%), with a mean rating of usefulness of 4.61 (from 0 (not at all useful) to 5 (extremely useful)). When asked what they thought of the programme, many described the programme very positively. In particular, many commented that the programme made them feel more supported and less isolated.

> *"Excellent programme. It gave me confidence to manage my own issues."*
>
> *"Excellent. Instead of the feeling of isolation, there was always a contact there who knew you and patient."*
>
> *"Is good. very helpful and felt supported."*
>
> *"Very reassuring to know that help is available at the end of the phone."*
>
> *"We thought the RPM was a very good service. We appreciated the frequent contact to monitor the home situation. We found the nurses to be friendly, knowledgeable, & helpful."*
>
> *"Very good, considering my condition in itself was very overwhelming so having that support in place and teaching me how to manage my heart failure gave me reassurance and confidence that I was ok and reduced my anxiety."*
>
> *"Helpful to me to know what to monitor & what I need to do."*
>
> *"It has been really helpful and a great help for keeping me in touch with the people who could help me."*

A few participant's comments referred to downsides or the programme including that the app did not always work and that the additional referrals and tests were expensive.

> *"Was good engagement from nurses. A lot of medication changes, drs referrals and tests which became expensive. App didn't work half the time."*
>
> *"Idea was good, if it worked well this is a helpful idea, app did not work all the time."*
>
> *"Bp and weight monitoring is good to see what stats are doing. However, it's quite a lot of work to do every day. App is unreliable as sometimes works and sometimes doesn't. The app sends negative feedback if your weight has not reached its set weight. Expensive going to doctors for new scripts, check-ups etc. Then pharmacy costs too. Nurses are good at following up by phone regularly and answering any of my questions. I have learned more about my cardio treatment since been on it."*

When specifically asked what they liked about the programme aspects identified included:

- The nurse support
  > *"Having the nurse call and confirm things I didn't feel alone in my recovery"*
- The reassurance from someone who knew their condition.
  > *"Having to fill it in every day and knowing someone reviews the answers forces you to be aware of where you are. The ability to talk with someone with specialised knowledge of your problem also is a great help."*
  >
  > *"Having someone who knew the patient and their medical history. Trying to describe the medical condition to a stranger Is daunting and difficult."*
- Having timely support
  > *"Good having access to all health information and immediate health support. Nurses rang when i was unwell and if I did not do my observations."*
  >
  > *" The personal contact was reassuring & the ability to adjust advice & medications in a timely manner was preferable to waiting a week for a GP appointment."*

- Being able to track their health over time
  "keeping an eye of my weight", "That it made me keep track of my BP."
- The alerts and monitoring functionality
  "Daily monitoring of symptoms and vital signs"
  "The ability to track progress and the automated messaging service. Whether it was reminder to use the app or advice given to follow up any trends etc."
- Ease of use
  "how easy to use the app."

When asked what they didn't like about the programme, 13 (41.9%) reported that there was nothing they didn't like. Of those that identified things they didn't like the most common response was related to technical issues (n=10; 32.3%).

"When it wasn't operational. IT issues."

"Zedoc did not work most of the time, spent time to enter details, prefer human communication rather than using a app"

"The remote form was inconsistent at best and not easy to start"

"The app has a few problems regularly."

Others reported aspects they didn't like such as getting reminders at 7am *(*e.g., *"The text that pinged me awake at 7 every morning"),* staff frequently being on leave*,* and restricted freedom because of the daily call. A few participants commented that they did not like the focus on weight and how this was done within the programme.

"Being hounded about my weight.!"

"Telling me my weight had increased from a text message is not very supportive when we know when we get on the scales"

"The part of the app that tells me I've put weight on when I've actually lost some. There needs to be a baseline explanation at the beginning of this section eg am I improving from the day I was discharged from hospital"

A total of 19 (61%) reported that they had technical issues with the phone app. For some they weren't able to use the app at all (e.g., "Unable to use the app so was grateful to receive telephone calls instead."), whereas for others the issues were sporadic:

"The app was not stable, regularly down"

"It didn't always load the form it took 2 or 3 days for them to get it to work"

"App not working most times, no solution to problems"

"Setting up at the beginning wasn't going through, sometimes it would crash so you couldn't use it".

Specific technical issues identified included;

- Having trouble logging in
  "can't remember the password. need to log in from time to time is a hassle."
  "I had difficulty logging into the site and needed the nurse to text me each day with a login site address."
- Not having a device compatible with the app

"My devices are too outdated to get the app so a link was texted daily but sometimes the link didn't work.)

- And getting error messages when trying to use it

  "opening the patient portal remote patient monitoring form, Keep show up " error, no medical record".

Participants were asked to rate (0 (extremely difficult) to 5 (extremely easy) how easy it was to use the phone app. The mean rating was 3.94 (range 0 to 5). Most of those that used the phone app commented that when it was working, it was good and easy to use. Other comments included:

"I really liked being able to look at the trend over time"

"Needs to be more information to add about the patient not just the heart like adding in the diabetic info etc which would give a more overall read"

"I tried using the phone app but I don't want internet on my cell phone. The email site on my Desktop, was way easier and better for me."

"We can't see our data history after we put it in"

When asked how many messages/emails they read the majority (n=21; 67.7%) reported that they read 'All or nearly all" of them, 5 (16%) read most (more than half) of them, 3 (9.7%) some of them and only 2 (6.5%) reported reading none of the messages/emails. When asked what they thought about the number of messages/emails sent, the majority reported that it was the right amount (n=28; 90.3%) with the remaining 3 participants (9.7%) reporting there were too many. Most participants (n=25; 80.6%) reported that they would have liked the option to send messages back and forth with their medical team through the app.

Perceived impacts:

All participants reported that participating in the RPM programme made them feel more supported regarding their heart failure (n=31; 100%). Participants also reported that taking part in the programme helped them learn about heart failure (n=28; 90.3%), impacted how they managed their heart failure or helped change their behaviours (n=28; 90.3%), increased how often they monitored their blood pressure and weight (n=30; 96.8%), and made them feel more confident managing their heart failure (n=29; 93.5%). There were 20 (64.5%) participants who reported that they thought taking part in the programme resulted in improved blood pressure and weight. Other impacts of the programme participants reported included:

- Greater peace of mind and increased sense of control
- Improvements in lifestyle behaviours, e.g., increased exercise, healthy eating
- Decreased anxiety.
- Improved long-term condition management, e.g., keeping track of BP or kidney function, greater understanding of medications.
- Not having to wait long to see/talk to a doctor or nurses.

General feedback

When asked how the programme could be improved, suggestions included:

- Continuing the programme

  "Continue to provide such an excellent opportunity"
- Greater consideration to those with low digital literacy or access:

"please be more aware of clients who are not connected to the internet - it was challenging to convince the initial assessor/ introducer to the program that using the app was not an option."
"Not user-friendly to elderly, no mobile phone or using device, need to wait for the nurse to call daily. It would be good, perhaps to include elderly consideration in this programme."

- Involving whānau
  "Get the whanau more involved"
- Fixing the app
  "Fix the app…"
- More human contact and the team consideration of the patient
  "i would like to have more human contact rather than phone calls"
  "Weekly zoom catch ups"
- And improvements to the patient-clinician relationship
  "Understanding which patient you're talking to before calling , I don't like having to repeat myself if there are notes and conversations had the day before it feels like your just a number."

All participants (n=31; 100%) reported that they would recommend the programme to others. Reasons why they would recommend it included:

- The support and reassurance the programme provided:
  "Heart failure is scary it is good to have a human being checking you are okay answering questions and encouraging me to get healthy"
  "We found the support given by the program was helpful to stay out of hospital longer - which we very much appreciated."
  "It makes you feel there is support and advice at the other end of the phone as well feeling safer."
  "I think it's amazing , the nurses are lovely and go over and above to give you reassurance and peace of mind"
- That the programme was empowering and helped increase confidence and knowledge to manage their condition
  "Gave me confidence to live my life with heart failure"
  "Great educational and monitoring tool, once people learn how how to use it, this program empowers people to manage their health, I know all this as i was a nurse before, i understand health promotion"
- That it was easy to use:
  "Ease of use and a caring exceptional team running it."
  "Easy to use the app and can keep in touch with the nurse, very good support"

Additional comments from participants included appreciation for the programme and the support they had received, sadness that the programme had ended and that they hoped that the programme would be available to others (not just with HF) in the future.

"A great programme and team that I would highly recommend to any heart failure patients."

"Great program and tool, this can take the load off from the hospitals, plse get your IT department to fix this - otherwise this a great idea for our communities. Could we please have an app like this for other health conditions eg diabetes this would help the hospital system"

"Look forward to it being more widely available for others."

"No just want to say thank you I really appreciate being on this programme."

"I would like to thank the nurses Karen and Connie for the support they gave me. Thanks very very much."

"I am sorry this programme is to finish."

POC Evaluation Results – Renal

Sample

The Renal POC was scheduled to run from April 2023 to October 2023. Between April and May a total of 18, from a proposed 40, patients were enrolled into the Renal POC programme. In May 2023 a decision was made to abort the Renal programme due to ongoing enrolment and technical issues. Troubleshooting the technical issues created increased technical burden on the clinician and patient's time.

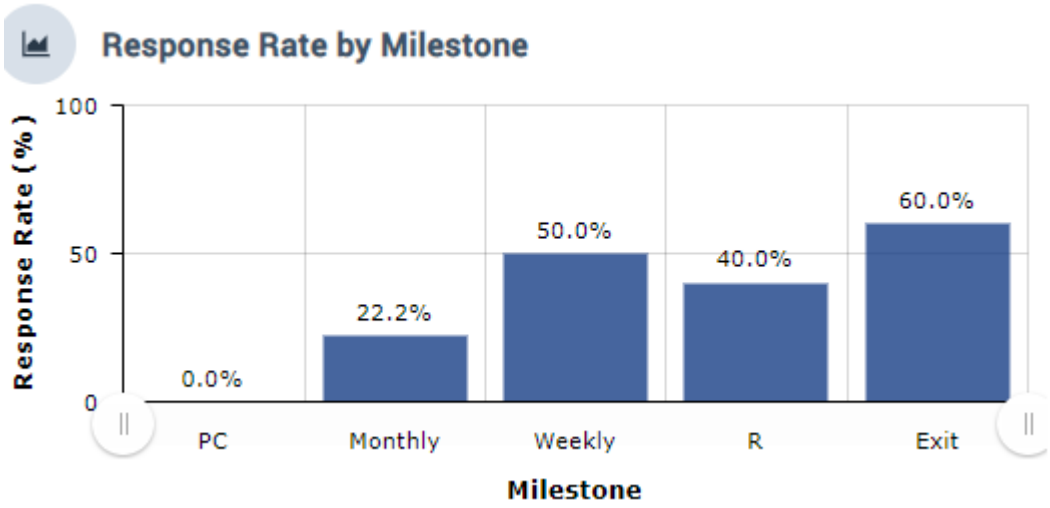
Of the 18 enrolled in the programme, two pulled out (did not complete). One patient requested to be discharged from the programme as it was causing them too much stress, the other due to issues with IT.

The final cohort of patients (n=16) had a mean age of 54 years and 56.2% (n=9) were male. A total of 50.0% (n=8) were Pākehā/ European, 6.3% (n=1) were Māori, and 43.7% (n=7) Pacific peoples.

Increased clinical oversight/ Patient Engagement

The overall response rate for the programme was 37.5%. A breakdown of response rate per milestone can be seen in Figure 7.

Figure 7: Response rate by milestone



The goal at the start of the renal programme was to test and utilise the app, as it allowed the patients to have access to their own trends and results as well as connecting their machine to Bluetooth if they wanted. However, the app did not work for any of the enrolled patients for the first 3-4 weeks. After this long period of time and burden on the patients to troubleshoot their app each patient was transferred to the no app option. The low response rate is a result of the initial weeks were no data was able to be input into the app. The no app text link worked the majority of the time with only a few patients reporting a blank screen when trying to open the link.

Due to the short time the POC ran there was no opportunity to use the pre clinic milestone.

Clinician Response and Intervention

During the POC a total of 65 alerts were generated, of the alerts triggered 55.3% were for a change in weight. These readings varied significantly from day to day and were considered by the clinical team to not be reliable or require intervention as long as their BP and HR were stable. The remaining 44.7% of alerts would require a clinical review and intervention, including a phone call to the patient, closer monitoring of their readings or medication titration.

Of the 18 patients enrolled 9 triggered multiple alerts and two of those triggered >10 alerts. Significant hypertension was picked up in two of the patients and resulted in their medication being titrated outside of their clinic schedule.

Improved Patient Outcomes

Due to the short timeframe of the POC programme it is difficult to attribute any improved patient outcomes, other than the newly diagnosed hypertension in two patients and their medication titration. Without a full audit of medication titration in the transplant clinic, it is difficult to say if the change in medication while in RPM was significantly different to a medication change in clinic.

There had been an initial goal to reduce the need for face-to-face clinics when a patient was stable and monitored at home, however, this provided to be a limiting factor to enrolment as the patients were keen to keep their face to face clinic schedule as it was a part of their routine.

Patient Feedback

There were 16 invitations to the exit questionnaire sent out. A total of 7 completed the questionnaire (43.8% response rate). Of those that completed the questionnaire 5 (71.4%) were female. Four of the respondents were Pacific peoples (57.1%) and the remaining were European/Pakeha (n=3; 42.9%).

A total of 5 (71.4%) reported that the programme was useful, with a mean rating of usefulness of 3.57 (from 0 (not at all useful) to 5 (extremely useful)). When asked what they thought of the programme response were clear that the idea of the programme was great but that the technical issues got in the way of its success:

> *"Good in theory, but buggy in application."*
>
> *"The app never worked so I had to manually put in my BP and weight readings so it didn't serve it's purpose."*
>
> *"Brilliant idea, if only it worked!"*

Three participants commented that the idea of being able to do their readings at home was great.

> *"For patients that don't drive, was easier to send through readings rather than coming into the clinic, and driver doesn't need to take day off from work."*
>
> *"Great! like that I was able to do my vitals from home and not go into clinic."*
>
> *"Using the tablet was a game changer - easy to use, you could converse directly with the Renal Lead and track results."*

When specifically asked what they liked about the programme all response related to the ability to complete monitoring at home and more frequently, and get feedback on this from nurses.

"*Being able to take my blood pressure frequently and having my renal nurse monitoring it.*"

"Been able to do it from home."

"Daily measurements, being able to adjust meds earlier, have access to the renal team via the tablet."

When asked what they didn't like about the programme all responses related to technical issues and the app not working.

"App wasn't working at all."

"Not been able to download the app as it didn't work for my phone."

"The app didn't work so had to record manually."

Only four of the respondents (57.1%) reported being able to use the phone app of which only one had no issues with it. All other participants reported technical issues with the app (n=6; 85.7%). Issues related to not being able to connect, app not working at all on their phone, syncing issues, or the link not being available.

"App did NOT work EVER! the link work around was tedious."

Perceived impacts

The most common reported impacts of the programme were that it increased how often they monitored their blood pressure and weight (n=6; 85.7%), and that taking part in the programme made them feel more confident managing their transplant (n=6; 85.7%). Respondents reported few other impacts of the programme. Two respondents reported feeling more supported regarding your transplant while on the programme. Two respondents reported that they thought that taking part in the programme resulted in improvements to their blood pressure. Only one participant reported that the programme helped them learn about kidney transplant and medications, and impacted how they managed their transplant and medications.

General feedback

When asked how the programme could be improved, all suggestions related to fixing the app.

"Make an app that works"

"Get it to work so patient can use it!"

Five of the respondents (71.4%) reported that they would recommend the programme to others. Reasons why they would recommend it included:

"It emphasizes the value of daily monitoring your vitals, post-transplant.

"It's helpful having your own BP machine and scales at home to take responsibility for your own health with increased support from the renal team."

"Daily monitoring helps with accountability and empowerment for individuals and enables the renal team to take potential early interventions they might not have had the opportunity to do otherwise."

"Having to be independent and not going into clinic"

The two that would not recommend it reported that this was due to the app not working.

Additional comments from participants included appreciation for the project lead and the support they had received, and that although the app didn't work it was a good idea.

> *"Renal RPM is a great idea, especially when BP is erratic & changes a lot. But NOT with this program, sadly."*

> *"With any trial the role the project lead plays is critical to its success and Michelle was key to us having a great experience on this trail. Her communication skills and patience made a huge difference."*

> *"A great idea. And most helpful in keeping an eye on particularly blood pressure.*

POC Evaluation Results – Clinician Experiences

A questionnaire was sent out to 96 clinicians who the RPM CNS identified as having an interaction with the service, this included:

- RPM CNS's (n=3)
- HiTH distribution list (n=29)
- Māori and Pacific Health teams (n=5)
- Individual patients GP's and Cardiologists (n=27)
- Gen Med medical teams (n=31)
- Renal SMO (n=1)

A total of 9 individuals completed the clinician questionnaire (response rate 9.4%)[1].

When asked what they thought of the RPM programme, respondents were very positive, reporting the concept was great and that it was useful and beneficial to patients. Despite being positive about the programme a number commented that the platform/app was not good and a barrier to the success of the programme.

> *"Great concept, except for the app. Giving CNS's the opportunity to work with clients in their own homes."*

> *"It was a good concept. As a clinical, the information gathered was useful. It was easy to obtain the remote measurements."*

> *"Excellent programme and I feel benefited the patient."*

> *"It is a great initiative by WDH, this is a useful resource and program that has a great potential to reduce rates of heart failure-related re-admissions. RPM teaches and empowers patients to manage their long-term condition and understand disease progression. This is a one-on-one contact and communication between a health care worker and a patient - enables patients to know what medications they are on and the rationale of being on these medications."*

[1] Two additional questionnaires were completed but excluded as the respondents reported no awareness of the RPM programme.

“Principle: great, so much opportunity. ZEDOC platform: terrible - an actual barrier to care delivery.”

“It is a good programme in term of nursing point of view, it give information about patient's HF status...”

Respondents reported many benefits to their patients of having access to the RPM programme. These included:

- Access to education about their condition giving them a greater understanding of their condition and how to manage it.
- Closer monitoring of their health.
- Access to clinical support while remaining at home.
- Increased empowerment to manage their health.
- Decreased stress and anxiety over their condition through the additional monitoring and support.
- Improved quality of life by being able to remain at home and not having to travel.
- Increased access to clinical support (i.e., overcomes barriers and delays in accessing GP)
- Prevention of readmissions or shorter stays where readmission is needed due to earlier escalation.
- Reminders to manage health and attend appointments increasing adherence/attendance.
- Being able to involve the whole whānau.
- Improved patient-clinician relationship through regular monitoring and contact.

When asked what the downsides were of their patients having access to the RPM programme, responses related to:

- Issues with the technology not working or patients not having the digital literacy, access (e.g. devices, internet) or confidence to use the technology as needed. Technical issues caused stress for patients and wasted their time as well as clinicians trying to solve the problems. Specifically, respondents mentioned the registration process being too complex, the app not being user friendly, and that having to log in was a barrier with patients forgetting passwords.
- Increased patient anxiety over having to do the measurements.
- The narrow inclusion criteria meaning that some patients that they thought should have access not getting access.
- Challenges related to workload for the CNS, lack of cover for leave and difficulties with handover
- There not being after hours or weekend support.

Three (33.3%) of the respondents reported an increase to their workload related to referring a patient into the RPM programme, two (22.2%) a decrease and the remaining no change in workload (n=4; 44.4%). Those that reported a decrease to their workload commented that this was due to the day-to-day monitoring of the patients being done by the program and by the resultant reduction in presentations. Those that reported an increase reported that this was due the lengthy onboarding process and to technical issues with the app resulting in extra work logging tickets (and following these up) and supporting patients with workarounds. One respondent commented that the program not being user friendly resulted in extra time navigating the system to get the data they needed.

Impacts of the programme

Table 1 presents the clinician reported patient impacts of the programme.

Table 1: Clinician reported patient impacts of the RPM programme (n=9)

	Yes	No	Did not answer
Improved patient medication optimisation	8	0	1
Increased patient engagement with healthcare services	8	1	0
Improved health outcomes (e.g., BP management, weight)	8	1	0
Reduced readmissions	6	1	2
Reduced face-to-face appointments	9	0	0
Reduced length of stay upon readmission	7	1	1
Improved patient quality of life	7	0	2

Other impacts respondents mentioned included reduced costs and time for patients and improved patient engagement with their health.

General feedback

Clinicians were asked how the RPM programme could be improved with the majority of responses related to improving the technology and the support for resolving issues with the technology. Other comments related to increased resources to support the programme (e.g., staffing capacity and providing devices), making enrolment easier and refining the inclusion criteria, improved communication with GPs and adding face-to-face support. Examples include:

> *"Better App, more resources - ability to do home visits to physically assess clients, provide technology so clients are not left out. Easy to use App - Zedoc a bit difficult to use for older adults, Eliminate the use of passwords - patients forgetting passwords then needing to reset them several times."*

> *"1) Be more user friendly for patients. 2) Less difficult to enrol patients into program. 3) For the app to actually work as it only did for one patient. 4) For there to be less IT issues and for better follow up of issues. They were persistent and not fixed when advised they were. This was time consuming for both patients and staff and was exhausting for patients. Most gave up int he end or were not willing to continue trying. 5) Better formatting of results. I was not able to scroll across and down at the same time."*

> *"The RPM programme would sit well within / alongside the HitH service using the expertise of the CNS to manage patients in the community Some face-to-face clinics with HitH NP and or HF CNS would optimize the care for the patients and hopefully reduce readmissions."*

> *"Easy to use app that is stable and doesn't crush often, App should be downloadable on most android devices. Ensure patient group enrolled meet the RPM inclusion criteria, numerous patients were older adults with co-morbid conditions hence difficult to manage. Inclusion criteria should/may include certain newly diagnosed HF - this will enable nurses to educate the clients' early in their disease process- preventing numerous future admissions… Planned face to face clinics at certain intervals so health care workers are not relying fully on patient self-reporting/service that allows health professionals to visit clients in their homes/ satellite clinics close to the community. District health board provided device to ensure everyone is included… Better communication methods with GP - mail/letters were sent to GPs but no acknowledgment that communication had been received."*

All but one respondent (n=8; 89%) reported that they would continue using the RPM programme if available. One commented that this was dependent on a different platform being used. When

asked how likely they were to recommend RPM to other hospital services, 50% reported they were 'extremely likely', 30% reported they were 'somewhat likely' to, and 10% 'somewhat unlikely'. The person who reported that they were 'somewhat unlikely' to recommend the programme commented that *"In general I would definitely recommend RPM to other services but I wouldn't recommend Zedoc unless the mentioned issues were able to be resolved.".*

Additional comments from respondents reinforced the value of the programme if the app/platform had worked and the screening and set-up processes had been easier. Others commented that they had appreciated the opportunity to take part in the POC and had benefited personally from being involved:

> *"Great idea and concept which would improve with resolving the aforementioned IT issues."*

> *"it's been a great pleasure to have been part of this program in nurse capacity, this has created awareness of the current/ongoing shift of health services to primary care rather than secondary care. This will change my practice as I have become more aware of common obstacles patients face after admission. If program is tailored well - it would be a tool to use to alleviate current hospital stays - given the growing population in Auckland and New Zealand. Initiative has a population focus rather than individual focus - the whole family unit becomes aware healthy diets and begin to understand a long term condition."*

> *"its a good programme - it would have been better if the App worked and screening patients was easier - we had to spend long periods looking for clients on Qlik - board, this wasn't updated daily. we had to use verbal referral from other cardiology CNSs, charge nurses or ward nurses. Sometimes we had to look through trend care or ward white boards to find patients, this was time consuming. We had to make time to screen patients in the ward as well as look through various Apps to find patients - plus log in tickets for the App that was always down, attend daily board rounds, call patients and respond to alerts. Other than this - this has been a good and enlightening learning process, I would definitely do this again, it's highlighted the health needs in our communities."*

Feedback on the ZEDOC platform

Five of the respondents to the questionnaire reported that they worked with the ZEDOC platform. These five respondents reported overwhelmingly negative experiences with the app due to the numerous technical issues. Examples include:

> *"Terrible experience, App was down most of the times, technical department took long periods to resolve issues."*

> *"…It was difficult having ongoing IT issues which were difficult to monitor and resolve. It took considerable good will from the patients to continue using the app."*

> *"Terrible - difficult to access results in a clinically-valuable format"*

> *"Challenging to use App - several outages/glitches - app unable to load data in chronological order at times - data seen to be mixed up. Unresolved issues at the start to the end of the program. App not user friendly for health professionals, had to sift through pages of date to locate pertinent information…"*

Four of the 5 (80%) reported they experienced technical issues these were wider ranging and had a significant I pact on their ability to deliver the programme e.g.,

"App crashes. App not syncing. App not use friendly. App lacked modern health app effects - for example could view a trends graph - had to scroll to find data - this was pretty confusing. Discharged and new patients still enrolled into app. App presentation not user friendly - if you add vitals you get logged then need to re-log in."

"…PDF FileZilla, not updated, CNS need to keep spending time checking and reported to ZEDOC to fix it. Time consuming. Enrolment issue, not sync properly, delay. No notification sends. No activation of daily milestone. Patient portal login issue. Onboarding issue. Daily milestone error, patient unable to open the daily milestone at time. Notification sends in wrong time, got complaint from patients a few times due to notification sent out at midnight."

When asked what they did like about the ZEDOC platform, respondents described that the platform gave them the opportunity to use technology to improve the health of their communities and the ability to support the monitoring of patients within the community in real-time.

"New technology promoting health in communities - reduces hospitalization, and time of inpatient admissions"

"Good to have ability to remotely monitor patients"

When asked what they didn't like about the ZEDOC platform responses related directly to the technical issues and poor usability of the platform.

"Frequent app outages, difficult follow up of numerous tickets, not very user friendly"

"Time consuming, complicated and required basic/intermediate phone knowledge to enroll. The app didn't work. Intermittent issues with SMS link. Spread sheet results good but not very user friendly."

"Frequent outages and crashes, not user friendly, had to scroll through a lot of data to access information I needed. Frequent outages and App crashes meant patients lost trust in CNS - patients were re-assured but outages persisted and were ongoing. Service provider was not aware of ZEDOC outages unless notified by nurses - wondering if there could have been a way of noticing this especially on weekends and public Holidays."

Clinicians were asked what features of ZEDOC helped them deliver and support the model of care, responses included:

"Patients taking charge of recording observations and new symptoms, this enabled them to note changes in condition early."

"Alerts for out-of-range measurements. The ability to remote monitor patients."

"Set up of milestone . Alert dashboard. Daily milestone with vital signs, weight, HF symptoms and record of patient concerns . The graph of BP trend and weight."

"Flexibility to enter vitals when it suites the patient. Enable and enhance self-management. Understand what vital readings mean. Understands one's vital trends instead of relying on information on the internet. Helped the patients develop routines for vitals and medications. Patients became more connected with GP practices - began to question why medications were prescribed."

"BP results available within system."

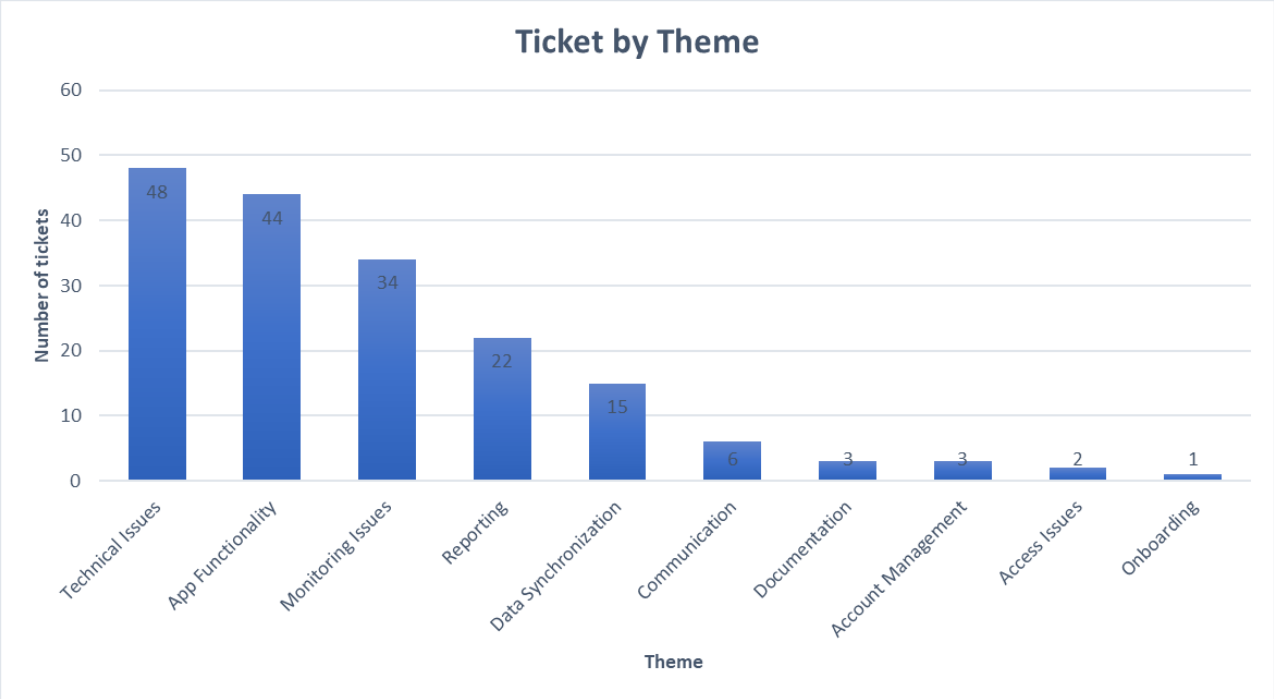
Finally, clinicians were asked what features of ZEDOC were missing that they felt would help deliver and support the model of care. Responses related to:

- An app that worked and was more user-friendly (especially for older adults)
- The ability to amend observations and add notes to observations
- The ability to view observations in date format easily
- Improved usability e.g., *"not being able to scroll across and down i.e. having to scroll down to bottom of measurements to scroll across"*
- The ability to enter the vital signs when needed due to abnormal results
- Ability to message (2-way with patients within the app.
- On-app technical support (not needed to log a ticket in another platform) and a visible timeline for tickets from time of submission to time of the closing of the ticket.
- The app being available to other WDH healthcare professionals so that they are aware of the patients' management journey.

Platform Usability

Throughout the feasibility pilot, digital platform issues necessitated logging helpdesk tickets for IT technician responses, with complex problems being escalated to digital scientists or the architectural team. There was a total of 158 tickets logged during the POC. Figure 8 demonstrates the number of tickets per theme from October 2022 to August 2023, detail of what is included in each theme can be found in the appendix.

Figure 8 – Number of tickets for each theme



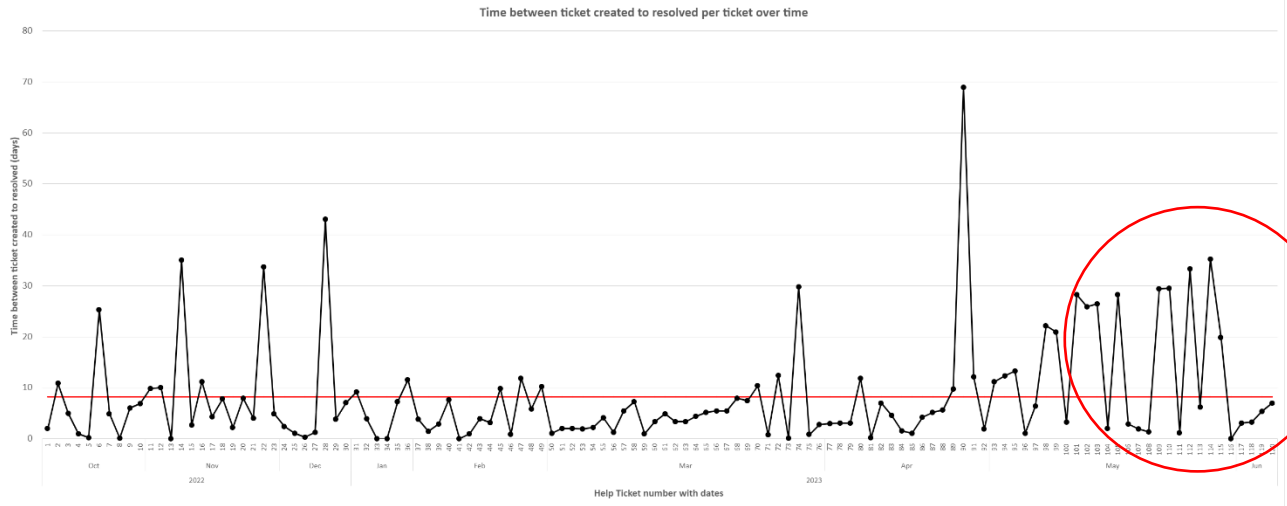
Help desk technicians were available daily, including weekends, 365 days a year. However, for intricate matters, the digital scientists and architectural team operated Monday to Friday, with a Christmas office closure. On the 25th December a significant system outage occurred, the helpdesk technicians were only able to support with regular temporary solutions until the team returned to the office. Following their return, a system upgrade was commenced early February.

Following the February upgrade, the system was still experiencing outages and issues with milestones not being available for patients to input their monitoring data. This prompted a meeting on the 8th March 2023 with the Senior Data Scientist and the leapfrog Senior responsible owner's (SRO) to explain the issues and discuss if solutions were possible, table detailing issues and

solutions discussed can be found in the appendix. A request from ZEDOC following the meeting was to simplify the digital workflow, this was believed to be the cause of the 30% demand increase on their resources. Several of the changes to the platform configuration had occurred during the live pilot and this had added layers of complexity which had not been appropriately tested or set up. A copy of the simplified workflow for renal and HF are available in the appendix.

Initially, a New Zealand-based helpdesk technician facilitated immediate responses due to time zone alignment. However, as the pilot progressed, initial response times were delayed. This issue was addressed with the project management team, who explained that the New Zealand technician had left, and the remaining technicians were based in Singapore, leading to a 4-hour response delay. This can be seen in the below run chart (Figure 9*)* where the time from ticket logged to resolution time becomes extended when the NZ technician left the team in April. The ZEDOC team are deep diving into the few tickets with particularly long time to resolution. No feedback has been given to the Waitematā team at the time this report was prepared on the outcome of their deep dive.

Figure 9 – time between ticket created to resolved



On June the 28th 2023, following a request for the helpdesk data, it was brought to our attention that there was no Service Level Agreement (SLA). This meant our tickets were all being managed as business and usual (BAU) and not within agreed timeframes according to urgency. Advised by the project management team they would follow up with the commercial team on why this was, however, no update has been received on this particular request.

Each logged ticket required accompanying screen shots for resolution. For patient portal issues, Clinical Nurse Specialists (CNS) assisted patients in capturing and sending screen shots. If it concerned the patient's phone, CNS had to guide patients in identifying phone versions and current system details. The process varied across phones, causing patient and CNS frustration and consuming significant time.

A solution proposed by ZEDOC for the ongoing issues with App access and reliability was to transition to a web based version, this would allow data to be input on different devices such as laptops and computers, however, it would lose the capability of Bluetooth pairing with the BP machine. To understand if this would impact patients a request was made to the ZEDOC team to provide data of when Bluetooth pairing was used or not used and to identify if an attempt to pair was made, however, pairing was unsuccessful. A full review of data shared can be found in the appendix. Table 2 below shows when an attempt to pair was made either using an Android or

Apple phone. The no app link was web-based access and blue tooth pairing would not be possible. A request for a review of the data was sent on 27th July 2023 as the data shared indicates 3 successful pairing with Bluetooth via the no-app link. The data didn't include any information on if pairing was attempted but unsuccessful, there has been no response to these questions to date.

Table 2 – indication of vital readings entered manually or via Bluetooth

Connection	Manual	Bluetooth	Grand Total
App Android phone	10	58	68
App Apple phone	283	16	299
No-app text link	675	3	678
Grand Total	968	77	1045

The CNS's found during the enrolment process, app functionality of patients with an Apple phone had less issues than patients with an Android phone. Table 2 supports their feedback as only 68 readings were logged via an app on an Android phone compared to 299 on an Apple phone. Android phones were used in 50% of enrolled patients.

Discussion

The 12-month POC for the RPM pilot programme aimed to establish an efficient and structured approach to data collection while enhancing the transition process from hospital to home for patients. This initiative involved the recruitment of specialised HF and Renal Transplant RPM CNS's supported by either a dedicated Renal SMO or HiTH medical team.

The RPM pilot received a favourable response from our patients, reflecting the value it brought to their healthcare journey. Patients appreciated the sense of connection it provided, enabling them to collaborate with their clinicians in understanding and managing their conditions effectively. The pilot played a pivotal role in bridging the gap between secondary and primary care, fostering a holistic approach to patient care.

This positive impact is substantiated by documented case studies and the interactions observed with general practitioner (GP) services post-hospital discharge. These interactions highlight the program's success in establishing a partnership between clinicians and patients, underscoring the potential benefits of empowering individuals to actively manage their health. Moreover, it emphasizes the program's critical role in facilitating a seamless transition from hospital to home.

Favourable Clinician feedback further supports the benefits an RPM programme can bring to the transition from hospital to home. They felt the programme enable patients to stay well at home by providing detailed education on their condition and medications, as well as being available to support as the patients required it. They highlighted the benefits of patients being able to record and see changes in their readings and learn to know the actions to support being well was especially empowering.

Despite the overwhelmingly positive feedback, it is evident from the POC evaluation findings that further refinement is necessary to create an efficient and user-friendly platform for patients and clinicians. The primary focus should be on minimizing technological burdens and ensuring equitable access to the RPM service. The piloted product was unable to provide this and, unfortunately, removed the opportunity to offer additional support, such as Nurse led clinics, due to the constant burden of troubleshooting problems and leasing with helpdesk technicians. The technology used should be intuitive and not pose obstacles, especially for older patients. The pilot already began excluding patients due to their age, or lack of a support person, as a certain level of technology literacy was required to review and resolve issues. It should be accessible to individuals with varying levels of digital literacy and technology access (up-to-date technology and

reliable internet connectivity) to prevent further disparities in healthcare access. The program should not exacerbate existing inequalities in healthcare due to technology limitations.

Operational challenges were encountered with the pilot, particularly in the HF segment. The process of identifying eligible patients for screening was found to be unreliable and involved labour-intensive manual workarounds when the system malfunctioned or needed updates. A substantial amount of time was spent screening patients who ultimately did not meet the criteria for the RPM pilot.

In contrast, the process of identifying suitable patients for the Renal Transplant RPM pilot was more straightforward, given the availability of a pre-existing list of post-transplant patients. However, it still relied on the clinical expertise of the CNS and SMO to identify those who would benefit from the POC.

In conclusion, the RPM pilot has demonstrated significant promise in improving patient care and the transition from hospital to home. Patients have responded positively to the program, appreciating the enhanced connection with their clinicians and the opportunity to actively manage their health. However, to achieve scalability and ensure equitable access, addressing technological and operational challenges is imperative. Future efforts should focus on refining the platform, streamlining patient identification processes, and maintaining a patient-centred approach to remote monitoring.

Recommendations

This POC has resulted in the following recommendations for future delivery of RPM:

- A reliable process for identifying eligible patients and screening for enrolment.
- Ensure the right level of care is designed for the right patient cohort, with access to specialist support/ advice.
- Co design the model of care with consideration for the patient/ clinician needs with each new service looking to implement RPM care. Avoid copy and paste approach which could miss nuances of individual patient cohorts and services.
- Digital platform needs to be flexible to adapt to each service requirements and needs.
- Digital platform needs to be user friendly and not be dependent on a phone type, version or patients own data/ WIFI.
- Consideration regrading location of the digital platform helpdesk. Local allows reliable and timely responses.
- Access to clinicians via messages and video call to enable connection between patient and clinician.
- Interoperability of devices could aid usability and patient experience. While also having the ability to allow patients to use pre existing equipment. Reducing electronic waste and unnecessary additional cost.

Appendix

Model of Care


HF Model of Care document.docx


Renal model of care document.docx


Heart failure model of care v8.pdf


Renal model of care v7.pdf

ZEDOC Documents


Ticket details for each group.docx


[March updated - simplified] WDHB H


[March updated] - simplified WDHB Re


ZEDOC meeting - issues 08.03.23.docx

Te Whatu Ora
Health New Zealand