Te Whatu Ora
Health New Zealand
Waitematā

Remote Patient Monitoring

Evaluation

institute for innovation + improvement

Date	18/05/2023
Version	1.0
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Contents

Executive Summary

This report outlines the evaluation of a proof-of-concept (POC) Remote Patient Monitoring (RPM) program, specifically piloted within the Renal service with a cohort of 34 patients. The primary objectives of the RPM initiative were to increase patients' awareness of their long-term conditions, enhance patient engagement, provide support from renal teams, and ultimately improve health outcomes, potentially delaying or preventing the need for dialysis or transplant.

The pilot cohort, comprised of relatively stable patients with a long-term requirement for clinic attendance, who were given the choice to either attend face-to-face appointments or be managed remotely. Feedback on the model of care was overwhelmingly positive from both patients and clinicians. The program offered education and support at a pace conducive to patients' understanding of their conditions, fostering a sense of connection to the healthcare system during periods of recovery-related uncertainty. Notably, the service facilitated improved collaboration with the Cardiology service, addressing concerns about new cardiac medications following recent arrhythmias identified through the platform. Clinicians' regular access to patient data allowed for timely support, intervention, guidance, and referrals to services.

The digital platform utilised in the pilot demonstrated excellent design, proving user-friendly for elderly or less technologically savvy patients. It was reported as intuitive by both patients and clinicians. To comprehensively understand the platform's capabilities and explore its potential impact on health outcomes, scaling the program is recommended. A nationwide review of similar initiatives would facilitate the identification of the most suitable cohort, ensuring optimal opportunities for staff, patients, and the organisation. Collaboration with engaged services already inclined towards digital solutions would be a strategic starting point for success and sustainability.

In conclusion, the RPM pilot showcased significant promise in improving patient engagement and enhancing the management of long-term conditions. Positive feedback from patients and clinicians within the Renal services highlighted the program's effectiveness in providing education, support, and fostering a deeper understanding of patients' conditions. Moving forward, it is crucial to recognize and act upon overwhelmingly positive feedback, ensuring continued engagement of both patients and clinicians as new models of care are tested and refined.

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.

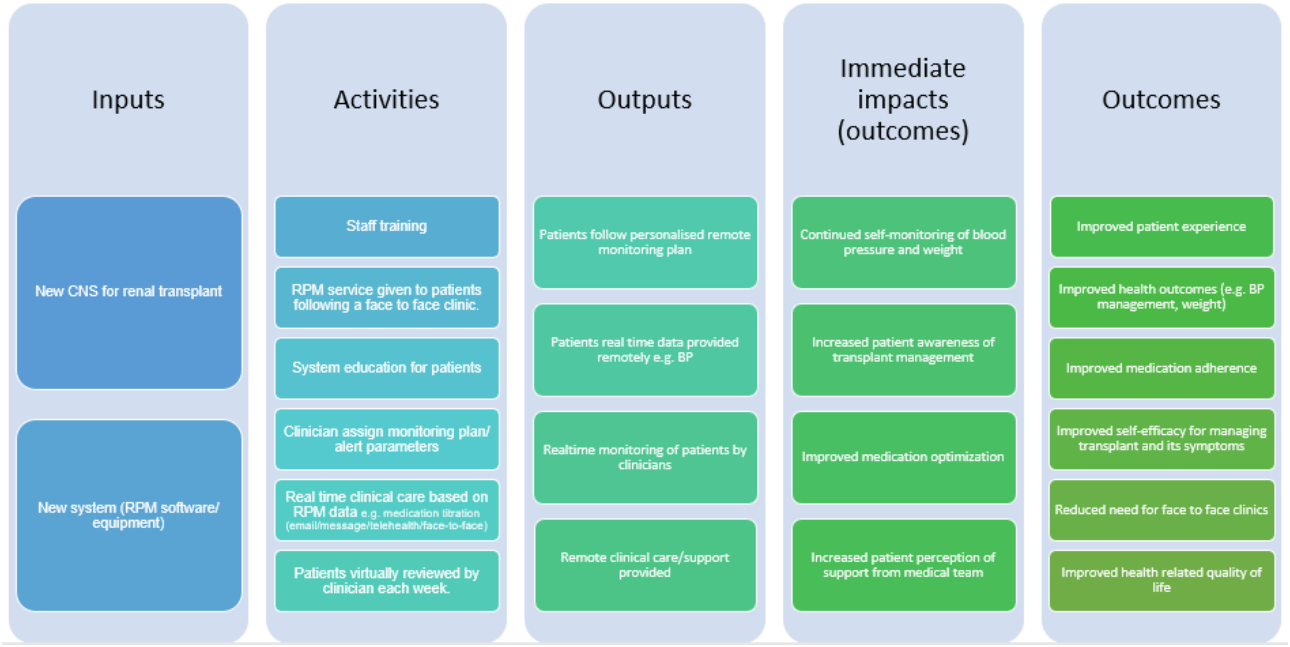
The renal services had existing remote monitoring models of care at Waitematā, which provided patients with monitoring equipment upon discharge or at their first clinic appointment. Data would then be sent over email or collected over the phone in a manual, inefficient and unstructured way which often 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 access to data and provide a more efficient and structured workflow. 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 synched devices.

The programme logic diagram for the renal RPM programme can be seen in Figure 1.

Figure 1: Renal programme logic diagram.

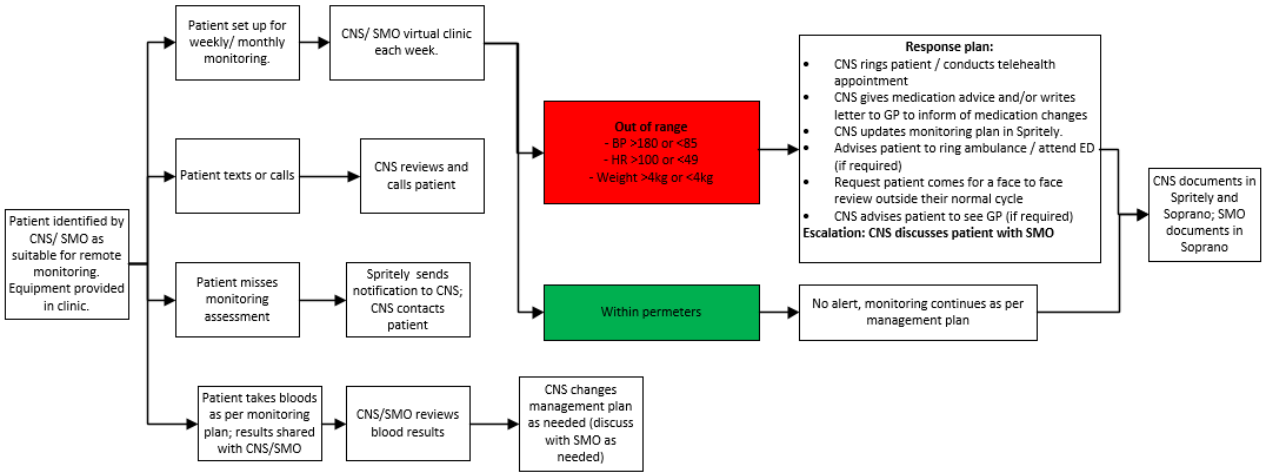


Proof -of-concept methods

A proof of concept (POC) to test the RPM programme was carried out between April 2023 and October 2023. The aim of the POC was to evaluate the feasibility and acceptability of the RPM model of care, for post-renal transplant patients.

The renal service 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 2.

Figure 2: Renal model of care



Sample

The eligibility criteria and exclusion criteria are summarised in Figure 3.

Figure 3 - Inclusion and exclusion criteria December 2022

[1] **Eligibility criteria**
- Patients requiring regular BP monitoring for titration of medication
- Age over 18 years
- Transplant patient under care of renal service
  - Stable clinic patient, ideally 18 months post transplant.
  - Can recruit suitable 12-18 months post transplant patients if needed.

[2] **Exclusion criteria**
- Significantly impaired hearing which impacts involvement
- Significantly impaired speech, vision or cognitive ability
- Resident of long-term care facilities
- Participating in another clinical trial
- Life expectancy less than 1 year

The SMO and CNS worked through a current list of approximately 100 patients who were 18 months post-transplant, to identify which patients met the above criteria. The CNS then contacted the patients who were identified as suitable for the POC and asked if they wished to take part.

There were 40 patients who met the criteria with 32 transplant patients agreeing to be enrolled in the POC. To test the model of care further 4 patients recently diagnosed with chronic kidney disease (CKD) were identified and contacted to take part.

Increased clinical oversight/ Patient Engagement

A welcome was set up for all enrolled patients, followed by a daily, weekly or monthly reminders, depending on the patient's wishes and clinical need. Regardless of the schedule of reminders chosen , the patient was able to complete a set of health readings as often as they wished or felt necessary. The CNS set the 7-day daily reminders for some patients first week to support the patient becoming familiarised with taking regular readings.

Renal programmes included:

- Welcome to the Renal POC
  - PDF information sheet on the RPM POC and purpose.
  - PDF management plan with contacts and routine information.
  - Video of how to perform a BP reading with the supplied machine.
  - Reminder to complete a full set of health readings (BP, HR and weight).
  - Initial assessment survey, to ascertain current symptoms and understanding of medications.
- Daily reminder programme
  - Daily reminders would be sent each day for a 7-day period.
- Weekly reminder programme
  - Reminder sent each week to complete full set of health readings.
- Monthly reminder programme
  - Reminder sent each month to complete full set of health readings.

The CNS was also able to send messages to patients via the device to remind them to complete their health readings, especially if the weight had been missed.

Clinician Response and Intervention

Parameters were set to indicate when a patient's readings were out of range. Following an out of range reading the patient would receive a health survey to assess their current symptoms and to determine if anything had changed. The CNS would then review the readings and survey results and make the clinical decision to phone or message the patient and escalate to an SMO when required. Parameters outlined below:

- Systolic blood pressure:
  >180
  <85
- Heart rate:
  >115
  <40
- Weight:
  >4kg increase
  <4kg decrease

For patients whose regular readings triggered an out of range alert a customised parameter was set up, to reduce alert fatigue and disengagement.

User feedback

In addition to system recorded data the POC was evaluated through patient and clinician questionnaire to assess acceptability, feasibility and impacts of the programme. Once the POC came to an end an exit survey was sent to their Spritely device. For patients who did not initially complete the questionnaire every effort was made by the CNS to follow up and support them to complete it.

POC Evaluation Results

Sample

The POC ran for 16 weeks from June 2023 to October 2023. A total of 32 post transplant patients were enrolled, from a proposed 40.

Of the 4 CKD patient identified 2 declined, one due to feeling overwhelmed and anxious. One patient felt he had been let down by the system with his new diagnosis and didn't wish to be involved.

The final cohort of patients (n=34) had an average age of 55 years and 55.88% (n=19) were male. A total of 38.2% (n=13) were Pākehā/ European, 8.82% (n=3) were Māori, 26.45% (n=9) Pacific peoples and Other 26.45% (n=9).

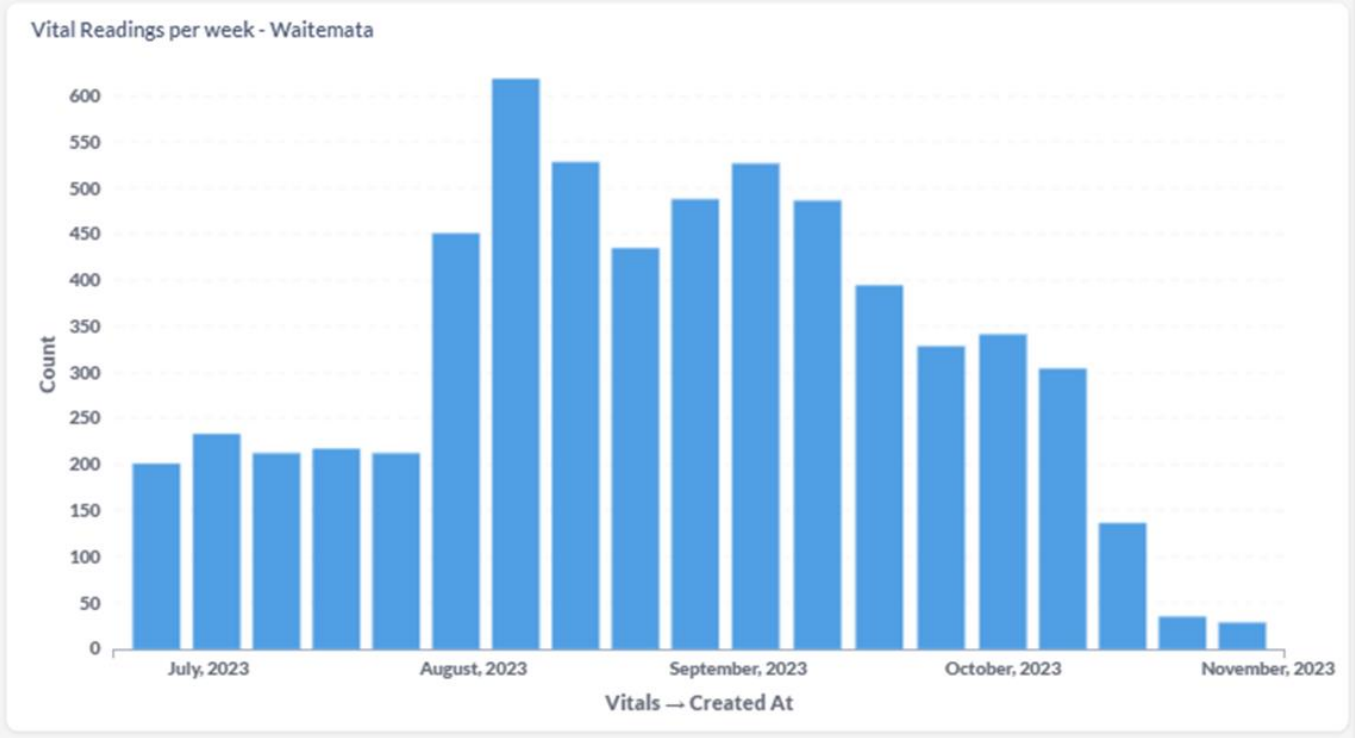
Increased clinical oversight/ Patient Engagement

The overall engagement with the Spritely device was high as can be seen in figure 4 below.

Figure 4 – patient engagement

Patients were very engaged with taking their vitals regularly, regardless of the reminder programme set. The vitals increased in August as we reached the total number of enrolled patients. The number of vitals only started to reduce as the POC ended. Use by week per month are shown in Figure 5 and demonstrates consistent stable engagement with the system.

Figure 5 – Vital readings per week, per month



The messaging feature was utilised well, however, the video calling feature was not used as much. Two main reasons for this; 1) the CNS did not have a camera on her computer, once this was realised a camera was sought and installed. 2) The prior workflow for the transplant CNS was to call the patient on the phone whenever they needed to contact them, in part due to reason 1. Figures 6 and 7 below show the number of messages and video calls created per week each month. The high number of video calls in July and the first 2 weeks in August were a part of the onboarding process to demonstrate what it looked like when a call came through. The gap between July and August where no calls were made were when there was no available camera on the CNS computer.

Figure 6 – Number of messages created each week

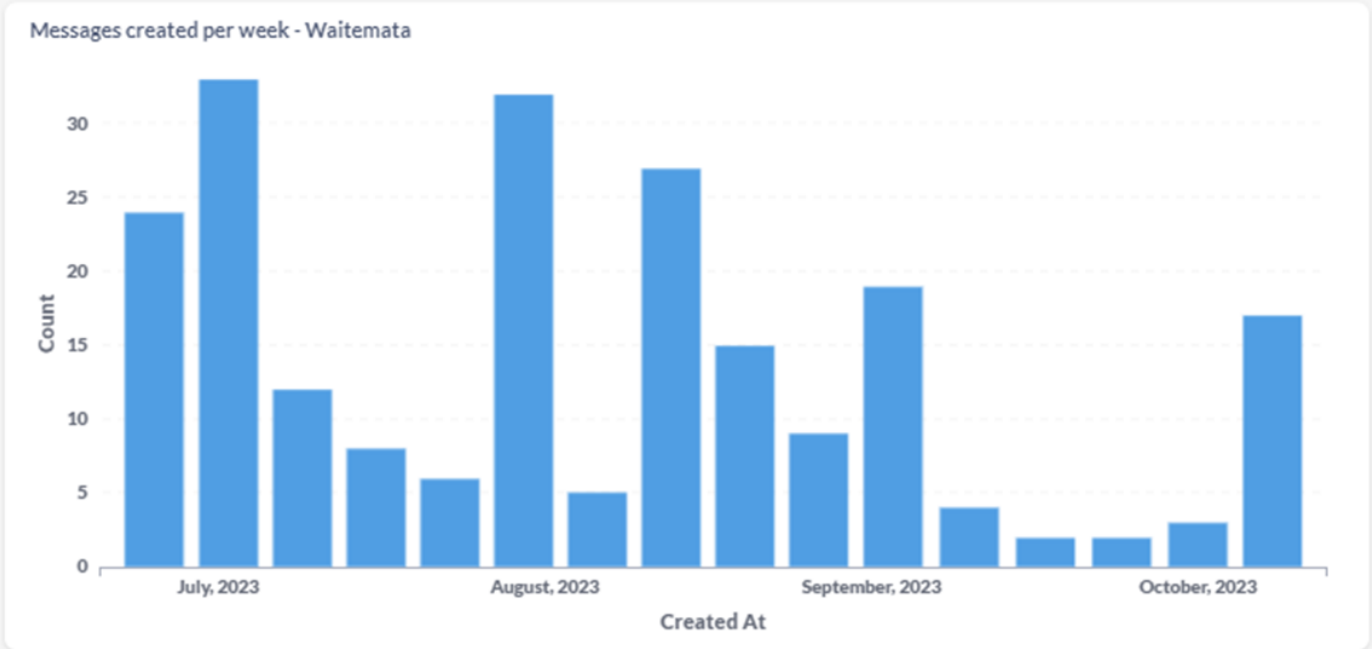
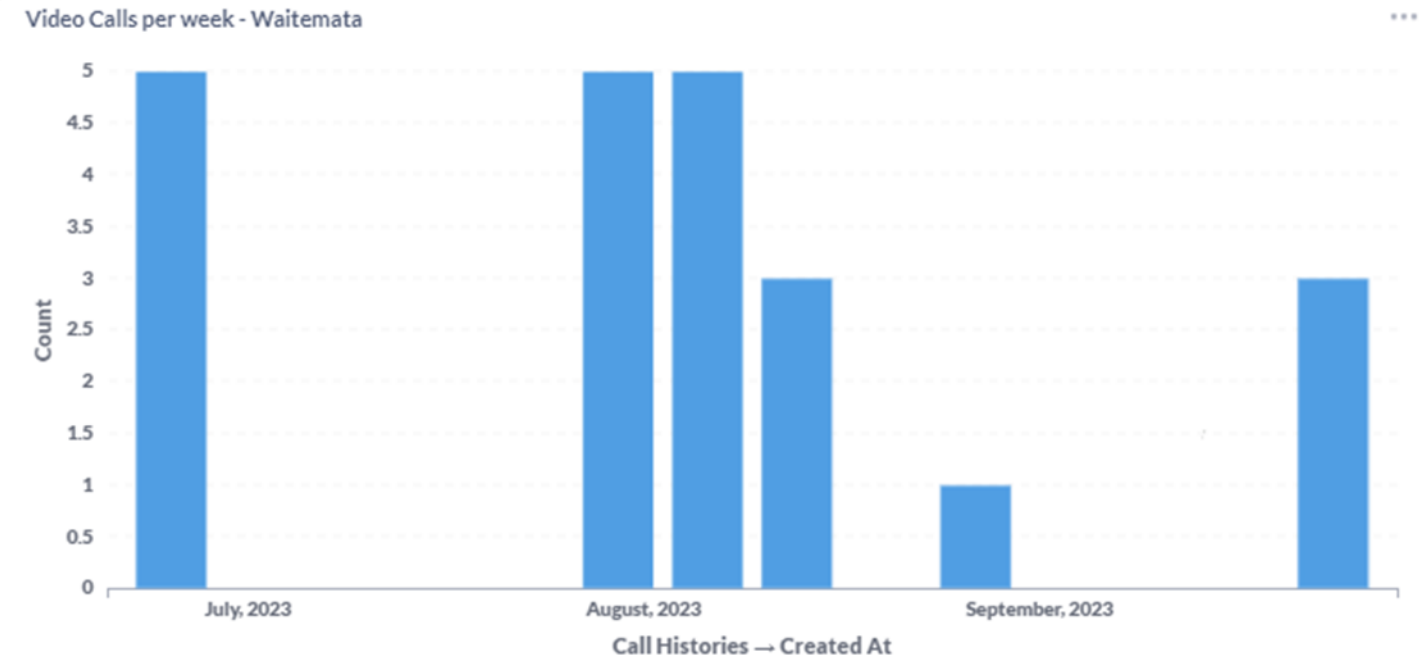
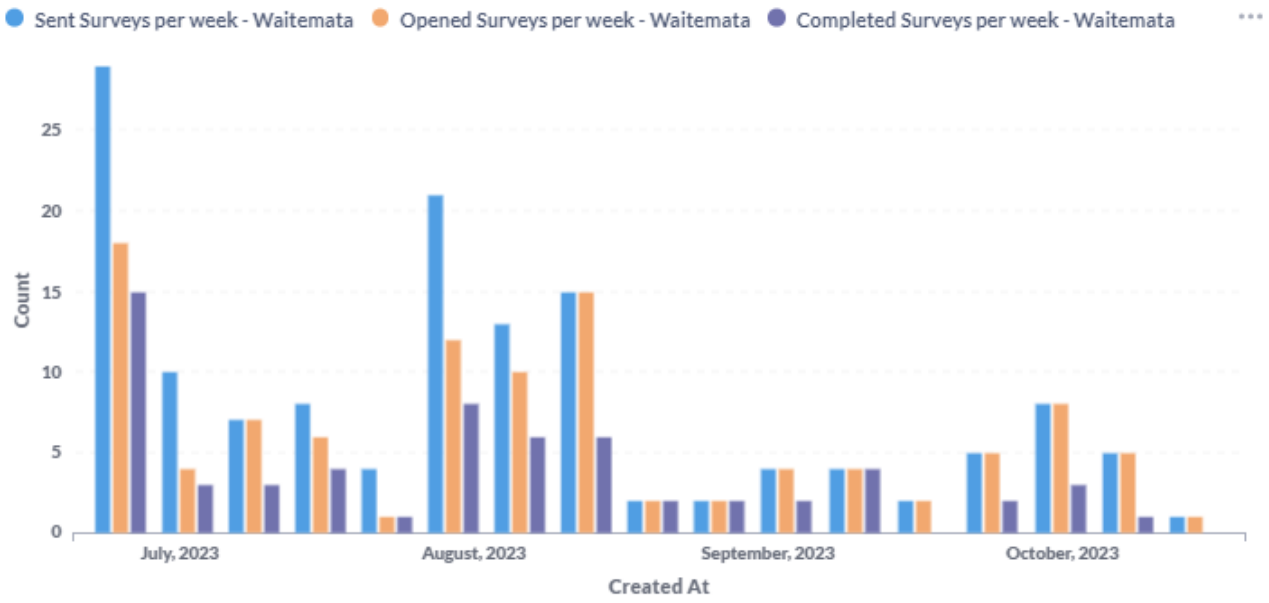


Figure 7 – Number of videos calls each week



Surveys were sent whenever an out of range reading was recorded to assess symptoms and at the point of enrolment, to assess current condition and understanding, and at the end of the POC. Figure 8 shows the number of survey's sent, compared to the number opened and completed.

Figure 8 – Number of surveys sent compared to opened and completed

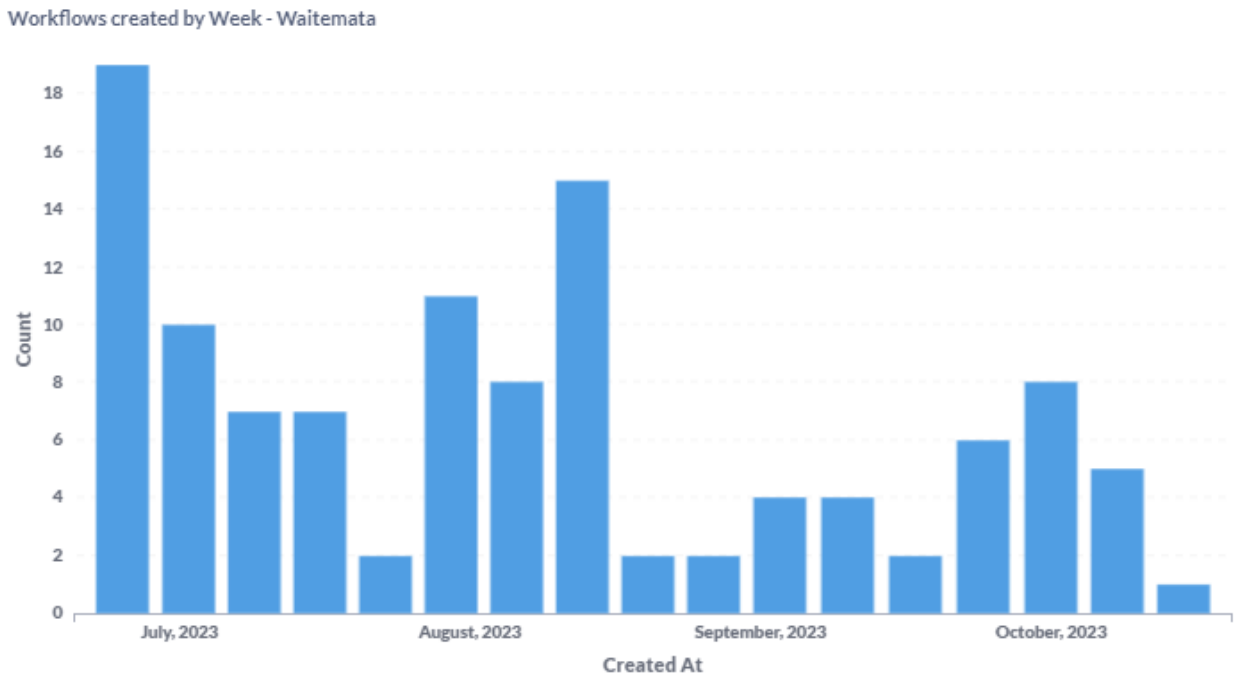


Clinician Response and Intervention

During the POC there were 61 alerts (workflows) for an out of range HR reading, 35 for an out of range BP reading, 6 for a change in weight and 11 requests for a telehealth appointment. A telehealth request was initiated by patients who felt they needed additional advice with the medical team beyond the messaging feature. When a patient requested a telehealth appointment, they were reminded it was not an emergency feature and if they had any of the symptoms listed, they were to call 111.

Figure 9 shows the distribution of workflows created by week and month. There is a high number across the two months when the enrolments occurred. As the POC progresses the number of workflows triggered decreased.

Figure 9 – Distribution of triggered workflows by month



Improved Patient Outcomes

From the data presented above it can be hypothesised that there has been an improvement in the patients' health management, treatment and outcomes. Previously these patients would not have had an intervention between their clinic appointments, therefore, their intervention has been timelier. However, it is unclear if there is a statistically significant difference in outcomes between a 3 monthly clinic review and RPM. An audit of clinic reviews and interventions would be required to understand this in more depth.

Patient Feedback – Evaluation Results

All patients (n=34) were sent an exit survey via their Spritely device at the end of the POC. A total of 23 completed the survey (response rate = 68%).

All respondents reported that the programme was useful (100%), with a mean rating of usefulness of 4.5 (from 0 (not at all useful) to 5 (extremely useful)). When asked what they thought of the programme responses were very positive describing it as very useful and that it was easy to use:

> *"A fantastic initiative. I would imagine it provides valuable insights to clinicians, as it certainly did for me. Thank you for this opportunity."*

In particular, they liked that they could track their BP and appreciated the additional monitoring and support without having to be seen in person.

> *"Nice to have blood pressure stats on hand. Easy to use and upload results"*

> *"I thought it was a valuable initiative. Although my bloods etc are taken on a monthly basis, the reassurance that another set of clinical is monitoring my vitals was and is comforting in my progressing years."*

"It was great as some days I was too busy to attend my check-up but doing my bp regularly at home gave the team more info on how I was tracking, I liked it."

"It's a brilliant way to provide medical supervision, giving patients peace of mind in challenging situations & direct access to medical advice."

When asked what they liked most about the programme, responses included:

- Ease of use
- Be able to self-monitor at home
- Knowing a clinician was monitoring them if something was wrong
- Not having to go to the clinic
- Increased self-awareness of BP

When asked what they didn't like about the programme 14 (61%) of the respondents reported nothing. For those that did identify things they didn't like, their responses included:

- Not being able to personalise the settings
- That it was challenging to learn and needed a manual
- Not getting feedback
- Charging the tablet
- Not noticing the notifications.
- Not being able to make edits if mistakes were made
- Concerns about the calibration of the BP machine

There were six respondents (26%) who reported that they had technical issues which related to challenges using the cuff (giving inconsistent readings, or difficult to position), forgetting how to use the system and issues with the default settings (screen brightness).

All but one respondent (96%) reported that the system was easy to use. A total of 16 (70%) reported that they read most or all the messages, with only 2 respondents reporting that they read none of the messages. The majority reported that the number of notifications (n=20; 87%) and the number of surveys (n=19; 83%) were the right amount.

Respondents were asked about the impacts of the programme (Table 1).

Table 1: Impacts of the RPM programme (n=23)

	Yes	No	Don't know	DNA/NA
I learned about my kidney transplant and medications	9	12	2	0
I increased how often I monitored my blood pressure and weight	19	3	1	0
Made me feel more confident managing my transplant	15	4	4	0
Felt more supported regarding my transplant	11	3	2	7
My blood pressure improved	7	8	5	3

Two respondents reported other impacts:

"Because of the direct contact with my renal team, I received answers and input (meds changes) during a difficult period of my health status"

"The convenience of not having to come into the hospital was fantastic."

When asked about suggestions for improvements, 19 (83%) reported no suggestions. For those that did have suggestions, these included:

- Keeping the programme going
- Using interpreters where needed
- Add an ECG monitoring option
- Replacing the cuff
- Providing an explanation on BP target ranges

All participants who answered the question (n=19; 100%) said that they would recommend the programme to others with kidney transplants. In particular, they felt it would be of use to new kidney transplant patients.

> *"I think it would be great for patients who aren't confident with being a transplant patient. I have been a transplant patient for over six years and am very blessed for the care I receive from my renal team. Because of them I feel competent in my self-care and knowledge, which is why I would recommend this programme for newer patients especially, while they are learning and adjusting in the early years."*

Reasons why they would recommend the programme included:

- The convenience of the programme
- The ease of use of the system
- That it provides independence
- The support and reassurance from the clinicians between clinic visits
- Encourages regular monitoring.

When asked about other feedback respondents commented that they had appreciated the opportunity to participate and wanted the programme to continue long-term.

> *"I am very grateful of this opportunity to have been able to try this. It has backed up that I am actually looking after myself. Thanks to the renal staff (all of you) for constantly looking out for us all and creating and trying new things like this."*

> *"I think it would be of immense value if this initiative was to continue in the long term."*

Clinician Experiences – Evaluation Results

There were four invitations sent via email to clinicians to complete the end of POC survey. This included a Renal SMO, two renal transplant CNS's and the POC Project Manager. Of these two responded (response rate 50%).

When asked what they thought of the RPM programme, respondents were very positive, reporting that it was great, easy to use and had the potential to make a positive difference.

> *"I think it is a great initiative with lots of potential to better serve patients, clinicians and the organisation."*

Both respondents reported that they would be 'extremely likely' to recommend the RPM programme to other hospital services and would continue using the programme if available.

> *"There are huge benefits to the patients feeling supported, being empowered to understand their own condition. Earlier intervention to help reduce complication further in their health journey. engagement high. patient and clinician satisfaction high. Really easy system with huge potential."*

> *"It was useful and helpful for patients and staff."*

The benefits of their patients having access to the RPM programme included:

- The ability to closely monitor their BP
- The ability to titrate medications outside of clinic times
- The availability of data and the ability to respond promptly
- That patients could ask questions and get responses to these in real-time.

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

- Some patients found it stressful or demanding to use
- Concern that a patient became hyper-focused on their BP measurement.
- The service ending with no plan for its scale-up

> *"The service gets taken away with no scheduled date or plan of when it will become something that is scaled. Patients love the system and service and don't understand when it is spoken about so highly it is not continued."*

Clinicians were asked about the impacts of the programme on their patients. Both respondents reported that the programme increased patient engagement with healthcare services and improved health outcomes. They had mixed views on whether the programme improved patient medication optimisation, medication adherence, patient quality of life or reduced face-to-face consultations (one thought it had the other not/unsure).

Clinicians were asked how the RPM programme could be improved; suggestions included:

- Incorporating the programme into the current model of care
- Offering all patients, the choice of RPM rather than clinicians deciding who should get it.
- Check the accuracy of the BP machines and scales
- Improving the format of the report to be more user-friendly and to reflect changes in medications etc.

Both respondents reported that they worked with the Spritely platform with neither reporting any technical issues. When asked about their experience with the platform they reported positive experiences including that the company was very responsive and communication prompt.

When asked what they liked about the Spritely platform, they described the ease of use, its flexibility and ability to customise, the call and video function and having measurements readily available.

> *"Easily customisable, I was able to add and amend things myself, did not need the vendor or their engineers for changes. Any changes made were immediate. I updated a survey in a patients lounge following their feedback and the survey was ready immediately after hitting save."*

When asked what they didn't like about the platform one said nothing and the other mentioned that some patients found it hard to use.

Next, they were asked what features of the platform helped them deliver and support the model of care, responses included:

- Medication notes
- The comprehensive recording of multiple measurements
- The ease of communicating with clinicians
- The customisable surveys which can be written in any language

- The video/call feature.
- The notification functions

Finally, clinicians were asked what features of the Platform were missing that they felt would help deliver and support the model of care. One clinician reported nothing whereas the other suggested integration with inpatient, outpatient and primary health care teams, and that if scaled up to a larger cohort then there should be a dashboard of their own specific caseload.

Platform Usability

The Spritely platform has been desgined in a way to be easily customiserable by the user and intutive in its use for both patient and clincian. This removed dependability on the vendor. The flexibility of the platform allowed for tailored updates as the user had admin access rights, self service and the opportunity for the user to become an expert on the platform functionaility. The tablet interface was co-desigened with 80+ year olds, which is clear in its simplicity and ease of use.

However, if an issue with the system arouse there was a self service portal. This was located within the provider platform and contained a number of articles and instructions on common functions of the platform. In the event these were not apporpriate there was a messaging feature where you could connect with the Spritely IT support team.

During the 16 week trial there were 8 tickets logged with the Spritely team. Of the 8 tickets none were due to an issue with the patient or provider technology. The self-service portal was not used for these tickets as they were not system issues, therefore, these logged requests are from emails sent to the vendor. One patient had an issue with the BP cuff reading error, on following this up the CNS identified it was due to cuff placement rather than a technology issue. Requests sent to vendor are shown in Table 2.

Table 2: IT Requests

Issue	**Email time**
Spritely access was provided and worked first time with no issues	Thu, 15 Jun, 09:48
Asked about setting up note categories. Note category was set up instantly while on call and Project Manager was able to set up her own categories straight away	Wed, 19 Jul, 13:25
Requests custom dashboard set up to replicate table she normally uses. Set up before next meeting. Captured in minutes on Jun 26 and completed before next meeting on July 5 also captured in minutes	Mon, 26 Jun, 15:14
Question at 13:48 can you filter on facility. Answered yes at 14:30	28 Jun 2023, 14:30
Requested access for additional CNS at 17:50. Access set up and granted at 17:56	28 Jun, 17:56
Requested access for additional CNS 14:20. Access granted at 14:40	29 Jun, 14:40
Requested NHI be added to custom patient charting table 14:04. Added at 17:54. Trend graph was also added following request in weekly meeting	24 Jul, 17:54
Question, can we edit vitals patients have entered 09:18. Answered in the affirmative 11:03	17 Aug, 11:03

The IT team and vendor were very responsive and ammenable to requests. Allowing for trust and relationships to be built with an attitude of working together to find the best solutions.

The Renal SMO reported improved efficiency when preparing for a patients clinic appointment and improved oversight of data treands which was previously only seen by looking thorugh patients previous clinic letters. There was a requirement by the SMO to be able to see the BP trend prior to

medication titration, point in time marker of when the medication was adjusted, folowed by a BP trend following the change. Spritley was able to promptly create a customised report utilising a time stamp from the medication change notes, within a continuous trendline of BP data.

Discussion

The 16-week POC for the RPM program in renal care aimed to establish an efficient and structured data collection approach. This approach empowered clinicians to make remote clinical decisions while enabling patients to better manage their chronic conditions. The initiative involved recruiting a specialised Renal Transplant RPM CNS supported by a dedicated Renal SMO.

The RPM POC received positive feedback from patients, indicating its value in their healthcare journey. Patients appreciated the connectivity offered by the messaging feature, facilitating effective collaboration with clinicians in understanding and managing their conditions. The POC instilled a sense of security by ensuring clinicians reviewed their data and responded to out-of-range readings. Patient feedback highlighted that access to their data fostered a sense of ownership of their health outcomes. The flexibility to choose between face-to-face clinics and video calls was well-received, as it allowed patients to avoid in-person visits while ensuring continuous health monitoring.

Analysis revealed consistent and high patient engagement, with a notable shift in workflow notifications and symptom review surveys. This suggested that while blood pressure and weight were measured frequently, the number of out-of-range readings decreased, supporting the hypothesis that health became more stable and better managed.

Positive feedback from clinicians reinforced the benefits of the RPM program in empowering patients to understand their health better. However, the small cohort size and lack of a review of the traditional clinic model make it unclear if there is a meaningful difference between medication titration via RPM and routine clinic visits. Additional CNS FTE was recruited for patient monitoring during the POC, but no extra SMO FTE was provided. The increased workload for SMOs due to monitoring outside routine clinic schedules necessitates careful consideration of the model of care and staffing before scaling.

Evaluation findings indicated that the Spritely tablet and monitoring devices were user-friendly, with no reported technical issues, except for some challenges with cuff sizes and placement. The onboarding and enrolment process may require review to ensure appropriate equipment and sizes are provided.

Identifying suitable patients for the POC was straightforward with a pre-existing list of post-transplant patients, but it relied on the clinical expertise of the CNS and SMO working through the list to identify which patients may be suitable for the POC. It's crucial to acknowledge the potential impact of individual or unconscious bias in this process.

In conclusion, the RPM POC has shown promise in improving patient care and outcomes, with positive patient responses to enhanced connectivity and active health management. The Spritely platform has demonstrated its capability to support this model of care. The next steps would require scaling the Spritely system will allow further learning on the impact of an RPM pathway and further test the capabilities of the platform.

Considerations

- There was 1 device which has not been returned, loss or breakages are not covered in the lease, contingency plan needs to be considered.
- There were 2 chargers not returned, a contingency plan needs to be considered.

- A Project Manager familiar with the Spritely systems could be used for training and support of the system in place of paying Spritely for this training.
- Details pertained to each service can be completed by the Project Manager to reduce any burden on the clinical team in the initial set up.

Recommendations

- Review other models of care being delivered around the motu to assess best options to deliver:
    - Efficiency.
    - Utilisation of current staff.
    - Access for patients.
- A robust process for delivery and collection of devices needs to be considered and put in place.
- Contingency for any devices or chargers that go missing.
- Utilise current Te Whatu Ora team/ Project Managers to support set up of a new service.
    - Service support and set up should take approximately 4-6 weeks.
- Test Spritely product at scale to maximise learnings and allow further enhancements to the system to suit the needs of Te Whatu Ora.
- Scale and set up Spritely in locations and services who are already engaged and have shown an interest to improve their current models of care with a digital solution.
- A robust onboarding process in place to ensure education and equipment is suitable for each patient.
- Patient experience should be considered as a balance measure with further investigation and/or support for those who may find the process stressful or create anxiety by over monitoring.

Appendix

Model of Care

Renal model of care document Spritely.d

Renal model of care v8.pdf

Patient Information

Information Plan.pdf

Te Whatu Ora
Health New Zealand