

Project Title

Primary Technology-Enhanced Care – Hypertension (PTEC-HT) Providing Care for Hypertension Closer to Home

Project Lead and Members

Project lead: Dr Valerie Teo Hui Ying

Project members:

- Ms Ng Ling Ling, Chief, Future Primary Care & Director, Community Engagement, MOHT
- A/Prof Gerald Koh Choon Huat, Clinical Director, Future Primary Care, MOHT
- Dr Ng Wei Liang David, Head, Special Projects Unit, NHGP
- Ms Jaclyn Fam Chai Yuen, Deputy Director, Corporate Planning, NHGP
- Ms Lim Voon Hooi, Deputy Director, Nursing Services, NHGP
- Dr Simon Lee Bing Ming, Chief Operating Officer, NHGP
- Mr David Kok, Director, Finance, NHGP
- Ms Angela Yeo Puay Yeong, Assistant Director, Future Primary Care, MOHT
- Dr Praveen Deorani, Data Scientist, Future Primary Care, MOHT
- Ms Teo Sok Huang, Research Fellow, Clinical Research Unit, NHGP
- A/Prof Tang Wern Ee, Head, Clinical Research Unit, NHGP
- SNC Er Lian Hwa, Senior Nurse Clinician, Ang Mo Kio Polyclinic
- ANC Evonne Oh, Assistant Nurse Clinician, Ang Mo Kio Polyclinic
- Dr Ong Kah Pieng, Family Physician, Ang Mo Kio Polyclinic
- NC Esther Zhang, Nurse Clinician, Ang Mo Kio Polyclinic
- Ms Hazel Yang, Care Coordinator, Ang Mo Kio Polyclinic
- SSN Chia Kaili, Senior Staff Nurse, Ang Mo Kio Polyclinic
- Ms Esther Ong, Care Coordinator, Ang Mo Kio Polyclinic
- Dr Ong Ai Li, Family Physician, Senior Staff, Ang Mo Kio Polyclinic
- Nur Atiqah Binte Surya Akmaja, Research Coordinator, Clinical Research Unit, NHGP

Organisation(s) Involved

National Healthcare Group Polyclinic, Ministry of Health Office for Healthcare Transformation

Project Period

Start date: Sep 2018

Completed date: Dec 2019

Aims

To assess the feasibility and effectiveness of a redesigned hypertension care model leveraging on technology to enable self-monitoring and self-management with remote support and tele consultations replacing polyclinic visits in National Healthcare Group Polyclinics

Background

With an increasing number of patients with co-morbidities, primary care needed to develop new care delivery models to manage an increasing load of patients with chronic diseases, reduce patient visits and improve patient outcomes. This was a potential patient segment which could be managed at home with technological assistance. A multi-disciplinary team from MOHT and NHGP was formed to work on this problem.

Methods

See attachment

Results

See attachment

Lessons Learnt

- A joint team which capitalised on its diversity and strengths helped the pilot to start and progress quickly. We were able to engage various stakeholders to overcome technological challenges and execute the plans with the care team well.
- The team engaged senior leadership in both institutions regularly to ensure that there was clear direction and support for the teams implementing the pilot.
- We started with hypertension management, which was clinically simpler and easier to manage remotely and so achieved quick wins from this pilot.
- Patients placed on the PTEC-HT program can be monitored and medications titrated without visiting the polyclinic, making it a valuable treatment modality in the current COVID situation

Conclusion

See attachment

Additional Information

- A joint team with diverse strengths allows us to engage different stakeholders simultaneously to contribute to the success of the pilot.
- Implementing and evaluating a technology pilot in healthcare is a long and complex process that can take almost 2 years for a pilot. Both teams need to be committed to the journey.
- Innovation in healthcare begins with an idea; but whether an idea eventually achieves success involves a lot of perseverance and strong execution.
- As we move towards a Smart Nation and as patients become increasingly IT-savvy, technology implementation in healthcare will play an increasingly important role to help care teams provide better care for patients in a more productive manner.

Project Category

Automation, IT & Robotics, Care Redesign

Keywords

Automation, IT & Robotics, Care Redesign, Productivity , Chronic Disease Management, Hypertension, Hypertension Care Model, Patient Care, Digital Health, Tele-Monitoring, Home-Based Self-Management, Primary Care, Design Thinking, Lean Management, Pilot Study, Cost Savings, Manhours Savings, Medical Services, Nursing, Administrative Office, Multi-Disciplinary Collaboration, National Healthcare Group Polyclinics, Ministry of Health Office for Healthcare Transformation, Primary Technology-Enhanced Care for Hypertension, Blood Pressure Monitoring Device, Chatbot, Incremental Cost Effectiveness Ratio

Name and Email of Project Contact Person(s)

Name: Dr Valerie Teo Hui Ying

Email: Valerie_HY_Teo@nhgp.com.sg



Primary Technology-Enhanced Care (PTEC) - Hypertension

Providing Care for Hypertension Closer to Home



Dr Valerie Teo Hui Ying, National Healthcare Group Polyclinics (NHGP)

A/Prof Gerald Koh Choon Huat, MOH Office of Healthcare Transformation (MOHT)

National Healthcare Group
POLYCLINICS

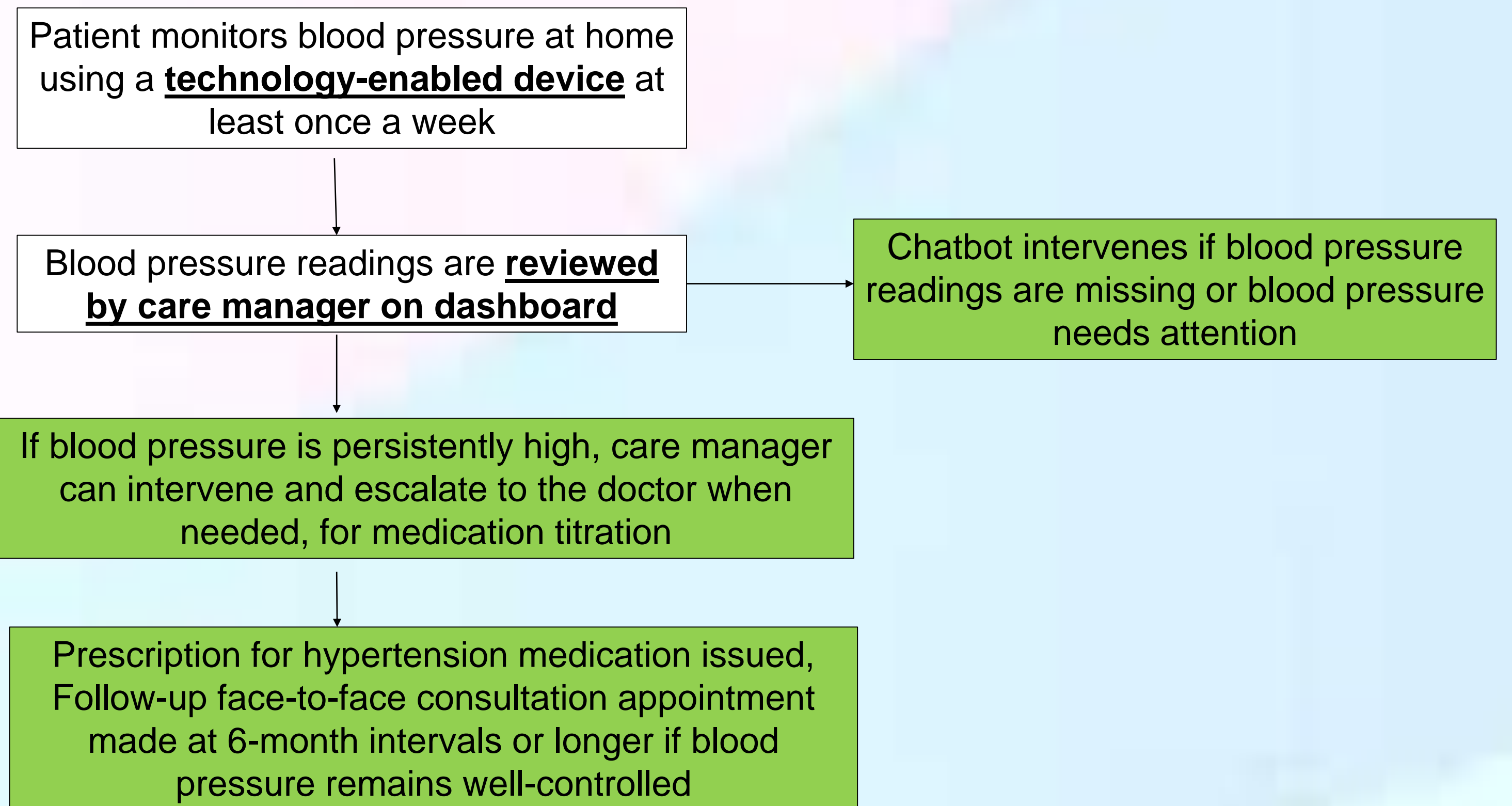
Mission Statement

Currently, most patients with chronic diseases, like hypertension, are managed through face-to-face consultations in the polyclinic. Patients need to come to the polyclinic, get their blood pressure measured, reviewed by a doctor or nurse before they can collect their medications and arrange for subsequent follow-up appointments. With technological advancements, patients with hypertension could get their blood pressure readings taken at home and transmitted to the care team for follow-up.

The aim of the pilot therefore, was to assess the feasibility and effectiveness of a redesigned hypertension care model leveraging on technology to enable self-monitoring and self-management with remote support and tele-consultations replacing some polyclinic visits in National Healthcare Group Polyclinics. The pilot was catalysed by MOHT under a series of PTEC initiatives with a vision for more wide-spread home-based self-management and effective care to prevent complications for chronic patients anchored by primary care in the community and closer to home.

Team Members

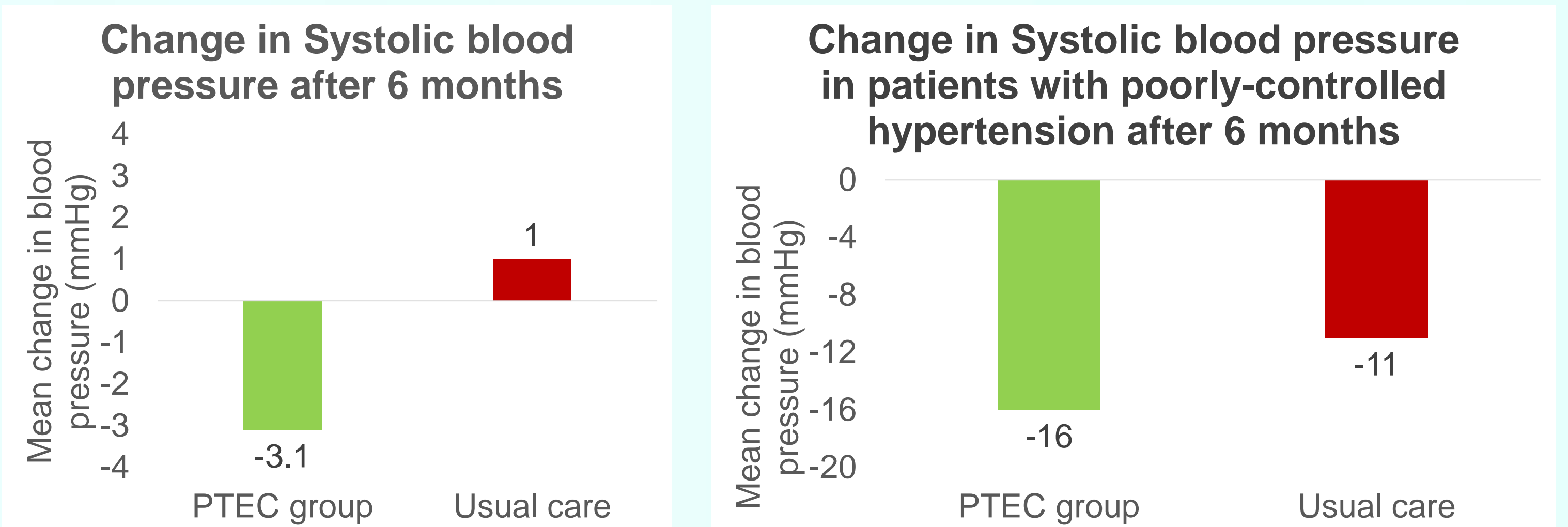
Name	Designation	Institution
Dr Valerie Teo Hui Ying	Deputy Head, Ang Mo Kio Polyclinic	NHGP
A/Prof Gerald Koh Choon Huat	Clinical Director, Future Primary Care	MOHT
Ms Ng Ling Ling	Chief, Future Primary Care & Director, Community Engagement	MOHT
Dr David Ng Wei Liang	Head, Special Projects Unit	NHGP
Ms Jaclyn Fam Chai Yuen	Deputy Director, Corporate Planning	NHGP
Ms Lim Voon Hooi	Deputy Director, Nursing Services	NHGP
Dr Simon Lee Biing Ming	Chief Operating Officer	NHGP
Mr David Kok	Director, Finance	NHGP
A/Prof Tang Wern Ee	Head, Clinical Research Unit	NHGP
Ms Angela Yeo Puay Yeong	Assistant Director, Future Primary Care	MOHT
Dr Praveen Deorani	Data Scientist, Future Primary Care	MOHT
Ms Teo Sok Huang	Research Fellow, Clinical Research Unit	NHGP
SNC Er Lian Hwa	Senior Nurse Clinician, Ang Mo Kio Polyclinic	NHGP
ANC Evonne Oh	Assistant Nurse Clinician, Ang Mo Kio Polyclinic	NHGP
Dr Ong Kah Pieng	Family Physician, Ang Mo Kio Polyclinic	NHGP
NC Esther Zhang	Nurse Clinician, Ang Mo Kio Polyclinic	NHGP
Ms Hazel Yang	Care Coordinator, Ang Mo Kio Polyclinic	NHGP
SSN Chia Kaili	Senior Staff Nurse, Ang Mo Kio Polyclinic	NHGP
Ms Esther Ong	Care Coordinator, Ang Mo Kio Polyclinic	NHGP
Dr Ong Ai Li	Family Physician, Senior Staff, Ang Mo Kio Polyclinic	NHGP
Nur Atiqah Binte Surya Akmaja	Research Coordinator, Clinical Research Unit	NHGP



Problem	Intervention	Implementation Date
New patient journey needs to be created	Design workshop carried out	30 July 2018
Suitable patients need to be recruited for pilot	Eligibility criteria & recruitment strategy for pilot project drawn up by care team Patient recruitment started	17 September 2018
Automation of routine patient care tasks need to be implemented	Chatbot developer appointed and algorithms and workflows mapped out with care team Chatbot deployed for patients	December 2018 November 2019

Results

The 6-month outcomes of patients on the tele-monitoring pilot were evaluated using a cohort study design. 103 PTEC-HT patients were compared with 115 patients with hypertension receiving usual care who were prospectively recruited for this study.



There was greater improvement in systolic blood pressure in patients in the PTEC group compared to the usual care group. Amongst patients with poorly-controlled hypertension at baseline, the PTEC group showed greater improvement in blood pressure compared to the usual care group after 6 months of follow-up.

There were fewer face-to-face consultations for hypertension amongst patients in the PTEC group compared to the usual care group (1.1 vs 1.5 consultations).

Interviews with patients showed that tele-monitoring increased awareness of blood pressure control and reinforced the need for regular blood pressure monitoring. Patients reported improved convenience with the reduction in visits to the polyclinic, and feeling reassured that the care team was monitoring their blood pressure.

The PTEC-HT program is proving beneficial in the current COVID situation. Patients can be monitored and medications titrated through the use of tele-consultations without having to make visits to the polyclinic.

A high level committee comprising cluster senior management has been formed to spread and scale tele-monitoring of blood pressure in primary care. MOH has also been engaged to include this technological solution as part of mainstream care delivery.

Patient Story

When Mr TBP signed up for the PTEC-HT program his blood pressure was poorly controlled at 161/99 mmHg. After onboarding, he was motivated and took his blood pressure daily. The care team was able to monitor his blood pressure regularly without him returning to the clinic for review. He was also empowered to improve his lifestyle. At the end of 2019, his blood pressure improved to 128/86 mmHg without any change in medication.

Cost Savings

The incremental cost-effectiveness ratio (ICER) was \$16,873 / QALY, which meant that PTEC was very cost-effective according to World Health Organization's (WHO) thresholds. If this technology solution were to be deployed to 25% patients in NHGP with hypertension with no co-morbidities, it could potentially save 11,094 man-hours per year, equivalent to 5 doctor / nurse full time equivalent per year.

Conclusion

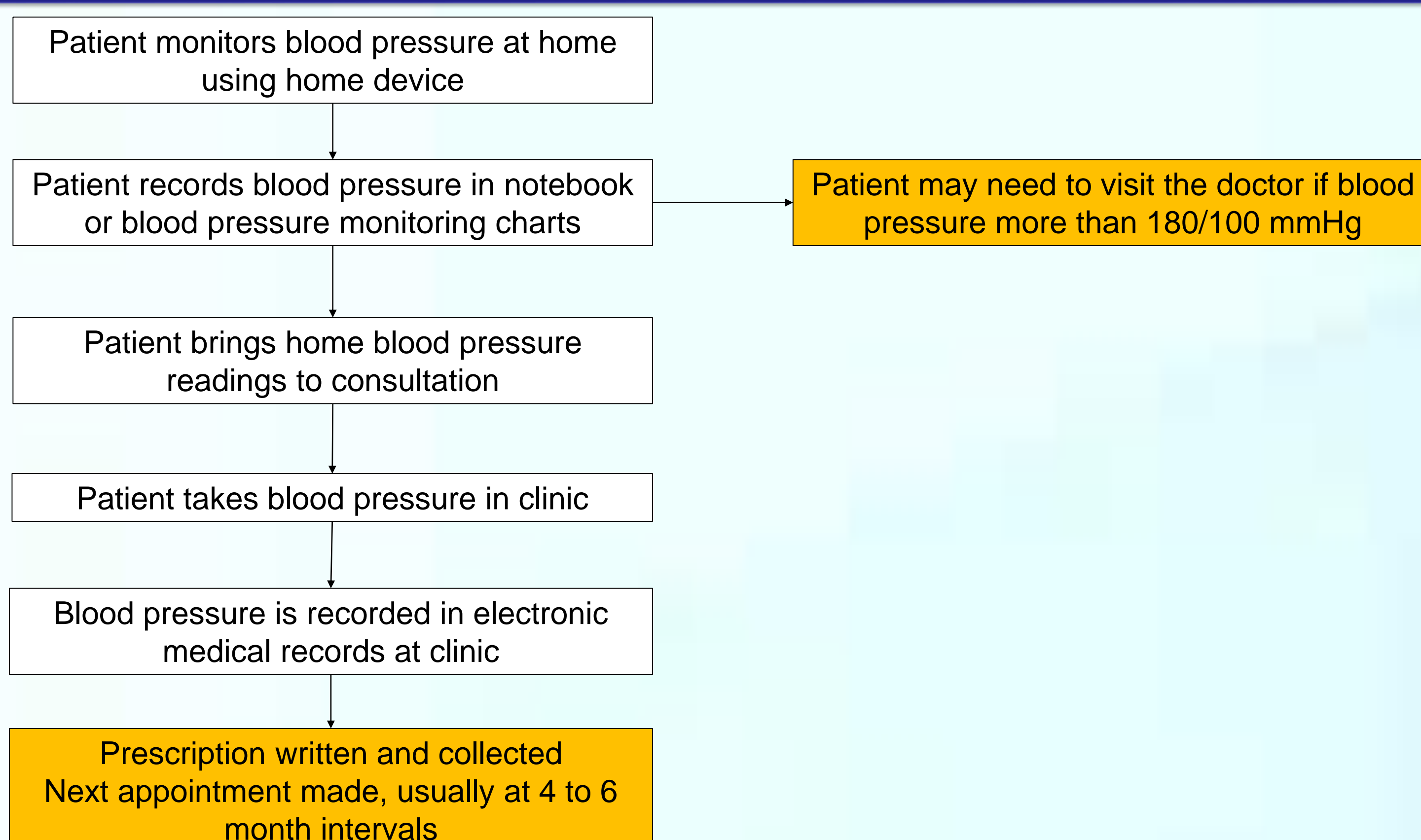
Tele-monitoring of blood pressure for patients led to greater blood pressure control, reduced face-to-face visits for hypertension and was well-received by patients. The pilot is expected to lead to manpower savings and is cost-effective if deployed at scale.

Evidence for a Problem Worth Solving

National Healthcare Group Polyclinics (NHGP) attended to 299,258 patients with chronic medical conditions in 2017. 55,470 of these patients had hypertension without complications or co-morbidities. This large patient population could potentially be managed at home using tele-monitoring, reducing the number of patient visits to the polyclinic whilst optimizing or maintaining good blood pressure control for these patients.

The TASMING2* trial showed that tele-monitoring of blood pressure for patients with hypertension in UK general practice led to a 17.6 mmHg reduction in systolic blood pressure after 12 months of tele-monitoring, compared to a 12.2 mmHg reduction of blood pressure in patients receiving usual care.

Current Process



Implementation

A suitable home blood pressure machine with a 4G gateway was selected as the interim vital sign monitoring technology solution for the pilot to provide the home blood pressure devices, 4G gateway as well as the user interface to start the pilot. A new chatbot was co-developed by NHGP and MOHT, using design thinking and lean management approaches, and deployed in a later phase to automate routine tasks to increase patients' adherence to self-monitoring, provide basic advice and enhanced productivity of the care team (allowing them to optimise their time for more complex tasks in the care delivery). In redesigning the hypertension care model, our workflow was customised to leverage on new technology capabilities brought about by the home blood pressure device and vital sign monitoring system, with processes refined over time.

* McManus RJ, Mant J, Bray EP et al. Telemonitoring and self-management in the control of hypertension (TASMING2): a randomised controlled trial. Lancet. 2010 Jul 17;376(9736):163-72.