

Innovating for Improvement

Home Monitoring of Hypertension in Pregnancy (HaMpton)

Maternal-Fetal Medicine Unit



About the project

Project title: Home Monitoring of Hypertension in Pregnancy (HaMpton)

Lead organisation: Maternal Fetal Medicine Unit, St George's University Hospitals NHS Trust

Project lead/s: Elaine Sheehan and Dr Asma Khalil

Contents

About the project	2
Part 1: Abstract	3
Part 2: Progress and outcomes.....	5
Part 3: Cost impact.....	10
Part 4: Learning from your project.....	15
Part 5: Sustainability and spread.....	17
Appendix 1: Resources and appendices	19

Part 1: Abstract

Hypertensive disorders complicate 10% of pregnancies and pre-eclampsia affects 2-8%. Pre-eclampsia can be life-threatening for the mother and baby – it is associated with adverse outcomes such as pre-term birth, fetal growth restriction, acute renal or hepatic failure, and maternal death.

At St. George's University Hospitals NHS Trust, the maternal fetal medicine team in conjunction with the Health foundation implemented and evaluated a new care pathway titled 'Home monitoring of hypertension in pregnancy' (HaMpton). This pathway involved the use of an innovative smartphone app for monitoring hypertension and identifying pre-eclampsia earlier than routine hospital care appointments.

Standard care pathways for women who have high blood pressure in pregnancy advises frequent hospital attendance to monitor for the development of pre-eclampsia. These frequent hospital visits can cause anxiety to pregnant women and their families, and have significant cost implications for the NHS.

This project involved the development and use of a smartphone app that allows women to monitor their health at home and alerts them if they need to attend hospital for further assessment.

Pregnant women who are at risk of developing pre-eclampsia were supplied with automated blood pressure machines and urine dipsticks. The women input their blood pressure readings and urine test results on the app. They then answered a set of trigger questions that helped identify women with symptoms of pre-eclampsia.

The aim of the project was to empower women to be involved in their own clinical assessment, improve patient experience and satisfaction, and reduce hospital waiting times.

Implementation and outcomes

We implemented the project in January 2016 and it ran over the course of 13 months. This involved a hypertension clinic that was held once a week with a maternal medicine specialist midwife and a consultant for obstetrics and maternal medicine. The clinic had the capacity for 14 women.

The maternity staff welcomed the intervention as it was clear that this project had the potential to bring significant changes. The maternity assessment unit like the majority of NHS departments, is very busy as it operates both scheduled appointments and a walk-in service. All hypertensive women are referred to this department. Home Blood Pressure Monitoring (HBPM) significantly reduced the number of appointments for hypertension by 53% and the amount of time per appointment.

The development of the app was challenging initially. We have since updated to a second version of the app. This update was necessary to implement the hospital computer system that links to the app. We introduced this new service in November 2016. This enables the patient's clinician to log on and see their patients' blood

pressure readings in real time.

The option for service user language has not been completed. We agreed as a team that this feature is not essential for this point of the project and will work to integrate this into the app at a later date.

To evaluate the service, we asked patients and staff to complete a questionnaire that would reflect their experience of the care pathway. Patients were invited for a postnatal appointment 4-6 weeks after giving birth to discuss their experience and provide feedback to the team on areas for improvement if applicable.

A health economist, Professor Richard Fordham was employed to work on the project and he advised the team on which areas we should focus on. He has recently provided us with a thorough cost analysis report which demonstrated cost savings as anticipated. There are further details of this report included under 'Part 3: cost impact'.

The development and implementation of the hypertension clinic transitioned smoothly without problems. The hypertension clinic has now become established as routine practice in the maternity setting. This was a significant milestone for the maternity team as previously this service did not exist as a specialist area and patients have reported how happy they are to be seeing the same professional about their blood pressure control.

The ethics application took up more time than anticipated and it was officially granted in April 2016.

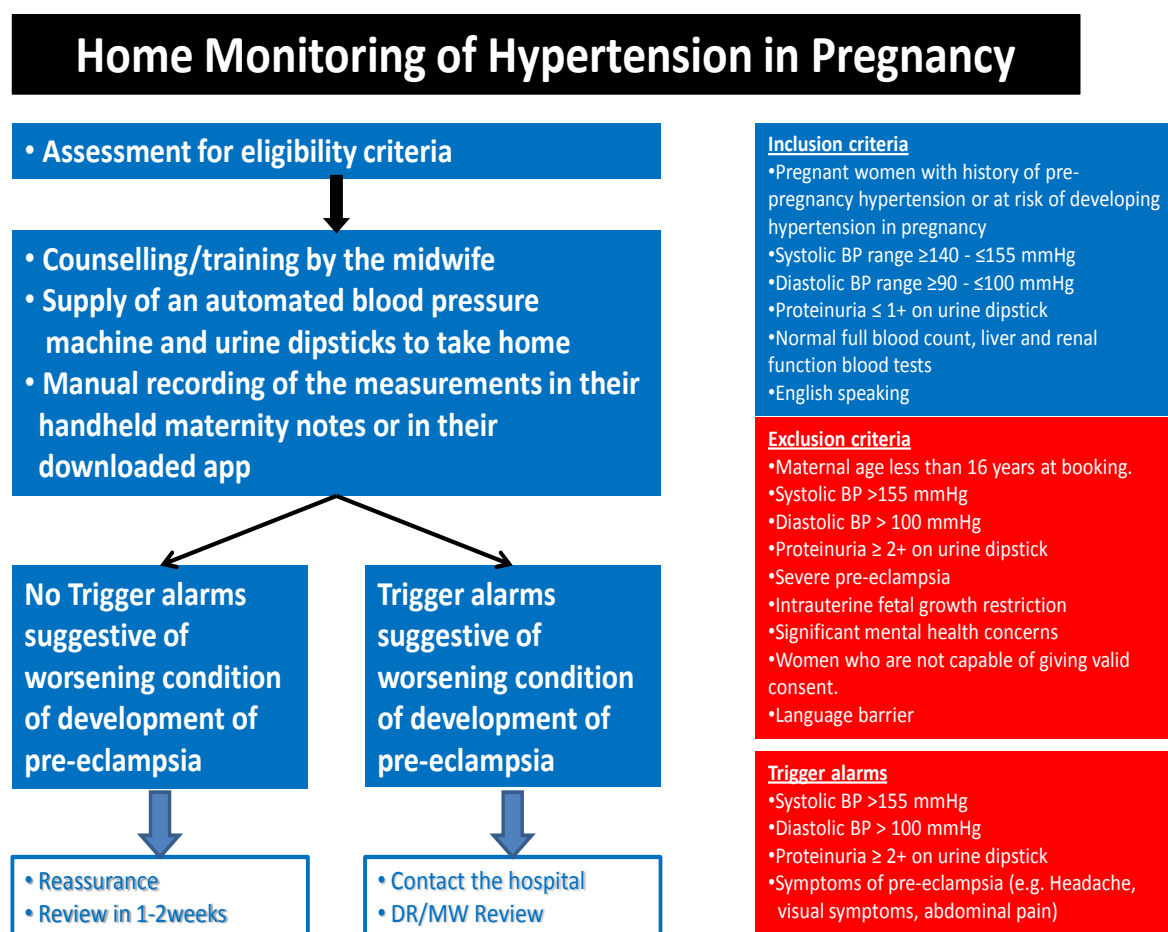
However, the feedback we have received from service users to date has made the challenges worthwhile. Women have highlighted the impact of continuity of care and person-centred care. We have noticed a significant improvement in the quality of care for white coat hypertensive patients. When these patients build a rapport with one practitioner that they trust, their blood pressure improves and this can improve the outcome of care for these patients by reducing medical intervention.

Overall, the project has been successful. We have demonstrated that HBPM is safe, clinically and cost effective and improves patient satisfaction. With the help of the health foundation and the determined efforts of our team, HBPM has now become embedded in routine practice.

Part 2: Progress and Outcomes

We made the care pathway available to all hypertensive pregnant women who met the inclusion criteria from January 2016 until January 2017. 83 women have signed up to the new care pathway. 49 of these women have delivered their babies safely. One patient was discontinued due to non-compliance. One patient miscarried. 3 women declined signing up to the new care pathway as they felt it would make them more anxious. The intervention included counselling women on how to monitor their BP and test their urine. Instructions were given on how to download the app and how to input the results. The app includes an instructional video. Women were informed what to do when their readings were abnormal or they became symptomatic for pre-eclampsia. Table 1 below summarises the care pathway:

Table 1: Home Monitoring of Hypertension in Pregnancy



Initially, we overestimated the amount of women who would require this service and calculated an average of 400-600 women. This figure was based on 10% of pregnant women affected by hypertension and St. George's Hospital has an approximate birth rate of 6000. Although the number of women who had or developed hypertension in pregnancy at St. George's Hospital last year (2015) was

9.7%, and similar for years preceding this 9.1% (2014) and 9.8% (2013), we never took into account the women who developed hypertension near their due date or while they were in labour. This is significant for our outcomes as these women usually have their delivery date brought forward and therefore do not have an opportunity to participate in this new care pathway. We excluded women who were not proficient in speaking English. We also had to exclude women who developed gestational hypertension after 32 weeks gestation due to limited capacity in hypertension clinic. In 2015, 220 (3.7%) women booked with a history of hypertension. We therefore aimed for 100 women to complete the care pathway, which is 17 patients under target.

Below is a summary of the progress and outcomes to date under the quality domains of safety, effectiveness, person-centred care, timeliness, efficiency and equity.

Safety

We were able to measure the safety aspect of the project by looking at any sub optimal outcomes as a result of using HBPM. For example, if a woman had a stroke at home as a result of high blood pressure. This data is available on our hospital database. Out of 83 women who have signed up to the care pathway, we had to discontinue one patient due to non-compliance. There have not been any sub-optimal outcomes to date. Sub-optimal outcomes include: cerebral haemorrhage, placental abruption, eclamptic fit, undiagnosed preeclampsia and stillbirth.

Detailed modelling of the standard out-patients and HBPM pathways, conducted for the economic analysis, demonstrated that home based blood pressure monitoring does not have any statistically significant effect on the prevalence of adverse outcomes. Age, pre-eclampsia end diagnosis, and total admissions (excluding delivery) were significant predictors of an adverse event ($p < 0.05$) but HBPM was not significant ($p=0.40$). This confirms the safety of the new pathway and procedures.

Effectiveness

From the feedback we have received to date (see table 2 and table 3), this is an effective service. Women have reported 94.5% patient satisfaction and 89% said they would opt for this care pathway in future pregnancies instead of traditional pathway. Effectiveness was measured via questionnaires from staff and patients and also the overall data analysis from time, cost and outcomes. Staff found it to be an effective service.

Table 2: Patient Feedback

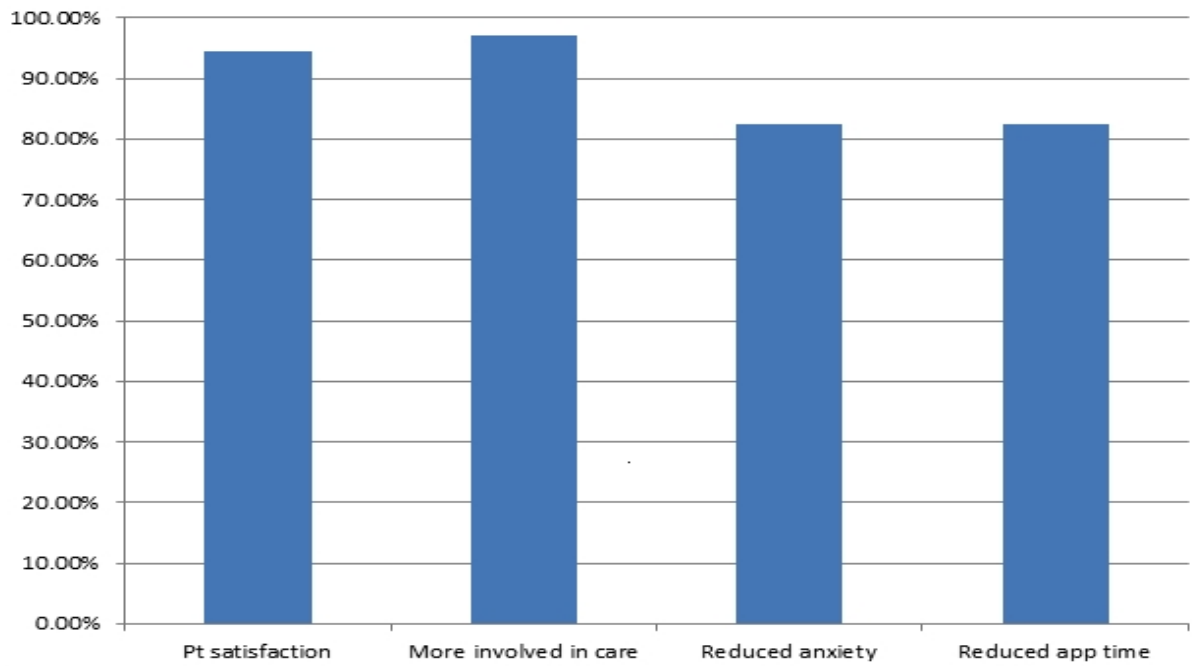
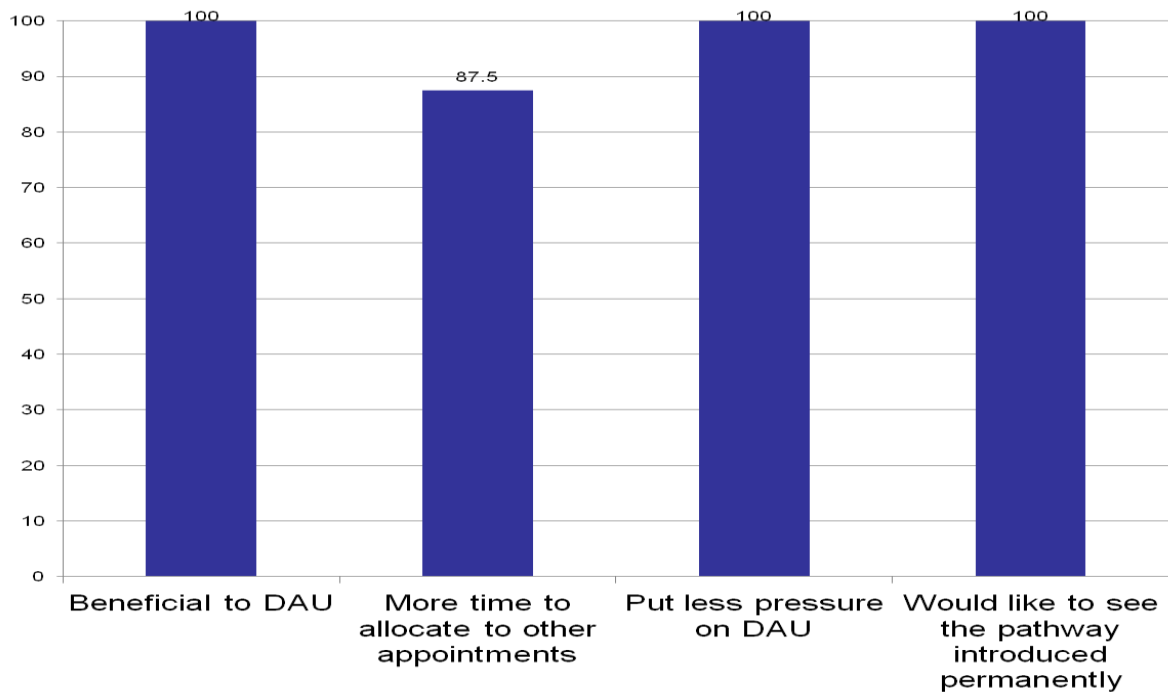


Table 3: Staff Feedback



Person-centred care

We aim to provide all our service users with person-centred care. This is measured via feedback from patient questionnaires. It is only the patient who can truly tell us if we have provided them with person-centred care. For example, women with hypertension are considered to be high risk. These patients are required to give birth in the delivery suite. We have helped some women who have strongly wanted to give birth on the midwife led birth centre an opportunity to do so by creating individualised plans of care for these patients to manage their blood pressure in labour. Please see patient story reflecting woman-centred care attached in appendix 1. This story was shared by one of our regular hypertension clinic patients who developed pregnancy-induced hypertension. She used the app for blood pressure monitoring and found it most useful. This was an interesting story as this patient had her first baby here at St George's Hospital, and therefore was able to compare her experience with the traditional care pathway and her experience with the new pathway. Other patients left comments on their questionnaires which we have quoted below:

"Felt much more at ease and less stressful than trying to get to regular appointments"

"I liked feeling I was the centre of my care. It is convenient and allows me to participate in my own care" (Anonymous, 2016)

Timeliness

We monitored the length of time a blood pressure appointment takes in the Day Assessment Unit and compare it against our set 30-minute blood pressure follow-up appointment. This gives us an indication on how much time we are saving as a service and also the time saved for patients. This project has reduced the appointment times from 1.76 hours to 1.03 hours in the day assessment unit. Hypertension clinic appointments have replaced routine antenatal appointments and take thirty minutes. Referrals to DAU for hypertension have been significantly reduced since introducing the hypertension clinic by 53%. A staff member working in DAU commented the following in response to the new intervention;

"The initial counselling of women for 'Home Monitoring of Hypertension' takes time, but it is still shorter than doing blood pressure profile" (Rivers, 2016).

HBPM also significantly reduces the time burden placed on women, since routine appointments are replaced with appointments according to need, obviating multiple out-patient episodes and travel and parking time.

Efficiency

Efficiency is measured by looking at the statistics for day assessment unit admissions and measuring the length of time for appointments. There has been a marked decrease in blood pressure follow-up appointments since introducing this service (53%). Other appointments have been created in the specialist maternal medicine teams who usually would caseload patients with chronic hypertension. Women have given positive feedback to date:

"I wish I had known about the app and started on the pathway earlier. I was

referred to DAU many times before coming under the care of hypertension clinic”

“I enjoyed monitoring my blood pressure at home instead of having to go see a midwife or doctor” (Anonymous, 2016)

Equity

Our original application proposed to reduce healthcare inequalities for women who have limited or no English speaking proficiency. The app was designed to include a language feature with an option of the most widely spoken languages of patients in South London (Urdu, Tamil and Polish). However, due to unexpected delays and challenges with the app development, this feature was not available at the time of project implementation. We are working to include this feature in the future as we are keen to provide this service to all our patients regardless of their ability to speak English.

Part 3: Cost Impact

One of the primary aims of our project was to streamline patient flow through the DAU and reduce the number of appointments for hypertensive women. It was hoped that as well as improving their patient experience and decreasing pressure on limited staff resources, there would also be a cost saving in this approach, without impacting on patient safety or experience. We have already demonstrated savings in our midpoint report, however at this stage of our project we wanted to undertake a more robust assessment based on actual comparison between women using HBPM and those on the traditional pathway, rather than on assumptions and subjective assessment of 'saved visits'. We have collaborated with a Health Economics team in order to achieve this.

Costs of the project

The main expense of this project has been the development of our novel Smartphone app. This was funded with the grant from the Health Foundation and has not required further costs since initial development. In order for more and more women to participate in HBPM we have had to invest in new BP recording machines. These are loaned to the patient for the duration of their monitoring period and reclaimed at the end of their pregnancy. No additional time or resource costs have been required for training of staff in using the app and HBPM as this has been done during normal working hours.

Expense	Cost
App Development	£10,881.64 (app) £16,540.00 (computer software)
New Equipment	£1800 (30 x £60)
Training	£0
Total	£29221.64

Cost Analysis

We have collaborated with Professor Richard Fordham and his team at the Health Economics Consulting group, University of East Anglia to conduct a cost analysis of HBPM compared to the traditional regime of monitoring BP at DAU visits.

Methods

Data was collected for 3 cohorts of women: 1) a prospectively collected group of women who had used the app for HBPM, 2) a prospectively collected group who had done HBPM but without the app and 3) a retrospectively collected group of women who had been monitored by the traditional regime. Demographic and pregnancy outcome data was obtained from ultrasound and maternity databases and hospital paper notes were reviewed to obtain DAU, antenatal clinic and GP visits as well as admission data. Variables recorded included initial diagnosis and end diagnosis, duration of monitoring, additional visits (outside of the normal antenatal care schedule) to DAU, antenatal clinic or GP for BP monitoring, admission to hospital for BP-related reasons and adverse maternal or fetal outcomes. Statistical Analysis was

performed using SPSS (IBM SPSS Statistics). Costs were based on a series of NICE costing templates, NHS practice's reports and relevant scientific research papers.

Results

The demographics and underlying diagnosis for the 3 groups are summarised in table 1. We also collected data on maternal and fetal adverse outcomes and analysis showed no significant difference in adverse outcome between the groups.

Descriptive Statistics		App – HBM Cohort	Non-App – HBM	No HBM Cohort
N		29 participants	79 participants	58 participants
Ethnicity	Caucasian	34.5%	74.7%	65.5%
	African-American	34.5%	12.7%	22.4%
	Asian	27.6%	10.1%	12.1%
	Mixed	3.4%	2.5%	–
Age (in yrs.)	Average	33.5	33.2	31.6
	Minimum	23	21	16
	Maximum	54	47	44
BMI	Average	32.77	28.11	28.77
	Minimum	21.1	17.9	20.1
	Maximum	55.2	46.9	44.2
	% of participants with BMI > 25	75%	67.1%	70.7%
Gestation Duration (weeks)	Minimum	31	29	30.4
	Maximum	41.5	41.4	41.6
Start of Monitoring (week)	Earliest	10th week	12th week	10th week
	Latest	37th week	39th week	37th week
Duration of Monitoring (DoM) (weeks)	Average	17.2	8.3	6.4
	Minimum	1.6	0.5	1.1
	Maximum	30.6	26.3	18.4
Other Characteristics	In Vitro Fertilisation (IVF)	3.4%	6.3%	3.4%
	Pre-existing Diabetes	3.4%	2.6%	3.46%
	Gestational Diabetes Mellitus	6.9%	8.9%	6.9%
Diagnosis	Chronic Hypertension	72.4%	40.5%	25.9%
	Pregnancy-induced Hypertension (PIH)	3.4%	53.2%	53.4%
	Pre-eclampsia (PET)	0	3.8%	10.3%
	White Coat Hypertension (WCH)	6.9%	0	3.4%
	Previous PET	13.8%	2.5%	6.9%

Table 1: Dataset Descriptive Statistics per study cohort

The HBPM groups had less visits to DAU during their duration of monitoring and those using the app for HBPM had few visits than the non-app group:

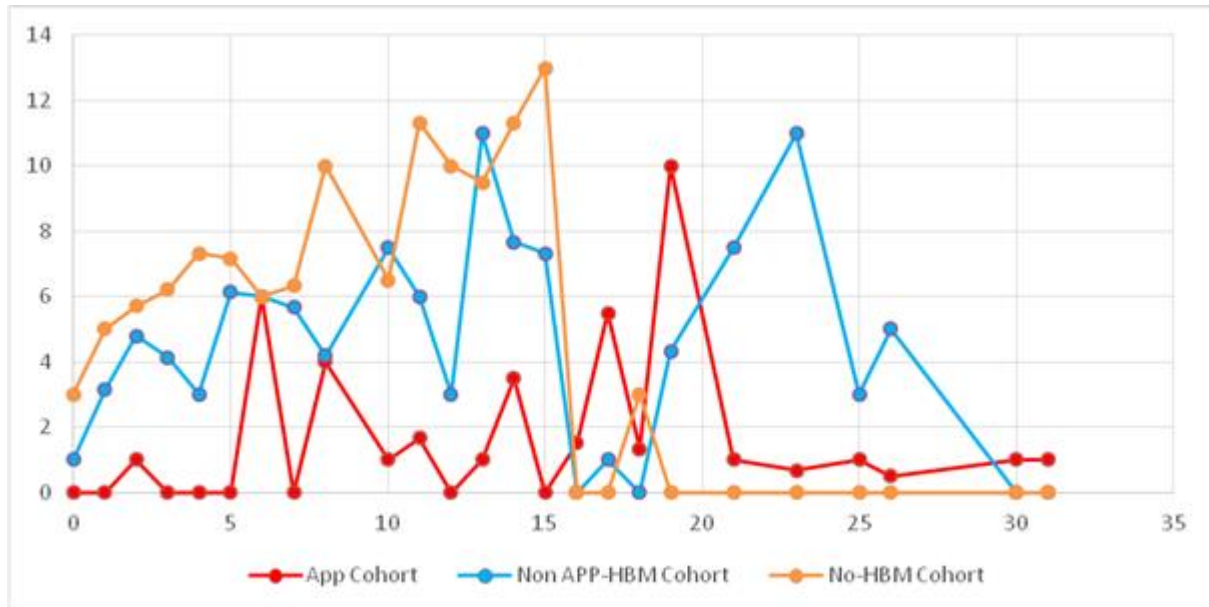


Figure 1: Average visits to DAU per DoM for all study cohorts

The cost analysis was performed in two ways. In the first, Process Modelling was undertaken, based on 2 common scenarios encountered in current practice:

1. A pregnant woman with hypertension attend the DAU for a BP check 2 or 3 times per week for 1 hour (40 min midwife monitoring with blood pressure readings and blood tests and 20min of doctor consultation).
2. Following the above scenario or in the case of newly diagnosed hypertension, a pregnant woman is admitted to the antenatal ward for closer monitoring and initiation of treatment.

Scenario 1	Scenario 2
<p>Old Pathway</p> <p>30-40 weeks pregnancy</p> <p>↑ Blood Pressure</p> <p>Monitoring at DAU 2-3 times /week (approx. 1hr)</p> <p>-Midwife -Blood tests -FBC -LFT -U&E -Fetal CTG - Doctors</p> <p>40 min</p> <p>20 min</p> <p>Review</p>	<p>Old pathway</p> <p>30-40 weeks pregnancy</p> <p>↑ Blood Pressure (>normal level)</p> <p><u>Admission</u></p> <p>Blood tests</p> <p>-FBC -LFT -U&E -Fetal CTG -Inpatient Costs</p>
<p>New pathway</p> <p>Monitoring at DAU</p> <p>-Once /week -Once /2 weeks</p>	<p>New pathway</p> <p>No need for Admission</p>

Table 2: Evaluation Scenarios

Calculations were performed based on costs for investigations and midwife and doctor time per patient visit. It was estimated that by using HBPM and thereby reducing the number of DAU visits required, costs per patient per week could be reduced from **£196.64-£294.96 to £49.16-£98.32.**

The second cost analysis was based on our actual dataset by comparing the number of visits to DAU, midwife and consultant antenatal clinics and GPs for BP reasons as well as the total number of bed days for BP-related reasons. This raw data was gathered from hospital notes so gives an accurate picture and again, demonstrates a cost-saving when using HBPM:

Cohort	Av. Cost per patient (Triage Nurse-Led/ Dr Led)	Av. DoM (weeks)	Av. Cost Per Week (Triage Nurse-Led/ Dr Led)
App HBPM	£1244.29 / £1246	17.2	£72.34 / £72.44
Non-App HBPM	£1853.56 / £1855.55	8.34	£222.25 / £222.49
All HBPM	£1692.56/£1694.48	10.7	£158.18 / £158.18
No HBPM	£2275.26 / £2276.26	6.43	£358.87 / £ 359.03

Table 3: Average Cost per Week per study cohort

Comment

Due to the underlying differences in the groups in terms of diagnosis and demographics, as well as size, some caution must be advised when interpreting our results. However, this pilot study based on true number of visits and admissions, as supposed to modelling, gives a promising indication of the potential for HBPM to save costs without compromising patient safety. The innovative app appears to apply an additional cost saving when compared to HBPM patients who were not using the app. This may in part be due to the higher proportion of chronic hypertensive patients in this cohort who may have had better controlled blood pressure compared to those with pregnancy induced hypertension or pre -eclampsia and therefore required less visits, however the fact that it gives patients a visual aid to show that their BP is in normal (or abnormal) range could have prevented them from coming to the Day Assessment Unit unnecessarily. The non-app HBPM cohort wrote their readings down on a paper table without any visual cue and they may have attended if they were unsure.

We did not survey patients in relation to personal cost savings from time off work, travel and parking costs. Patient testimony confirms that these saving are significant and meaningful.

Costs moving forward

The onward projected costs for continuing this project relate to establishing HBPM into routine practice. This will require an investment of more BP monitors machines and the license/maintenance fee for the app. It is not anticipated that any costs need to be assigned for training of staff as this will be done in routine hours. These costs can be estimated as:

Expense	Cost per year
Software Maintenance	£500
New Equipment	£2300 (100 x £23)
Total	£2800

These costs will be covered by Fetal-Maternal medicine budget.

Part 4: Learning from your project

We have demonstrated that HBPM is an effective care pathway and has advantages over the traditional model of care for hypertension in pregnancy. This was the primary aim of our project. Although we have achieved most of what we set out to do, there are certain objectives that were not achieved.

Success

Against the odds, we developed and implemented the computer programme that allowed women to communicate their blood pressure results in real time from their app to the hospital computers. This was a major milestone for us as a team as this is a truly innovative piece of work. This has not been done before and we are the first maternity unit in the UK to trial such an intervention. This great success was enabled by the relentless determination and efforts of Dr. Asma Khalil and Dr. Helen Perry. They worked hard to ensure that this programme was up and running before the end of the project.

Overall, the project was a huge success at a local level where we won first prize for most innovative quality improvement project. The project was recognised by the CQC at our most recent inspection in 2016 and received positive recognition in the published report. The doctors and midwives have welcomed the new care pathway and we have just finalised the protocol for implementation of the pathway to routine practice. This is an important milestone that means a lot to us as a team. It shows that staff are supportive of the care pathway and have recognised our efforts in improving quality of care for our women.

The team all worked hard individually and together to bring the project to success.

Challenges

We were unable to meet the objective for reducing health inequalities for women who didn't speak English. This task was bigger than we first anticipated. We focused a lot of our time and energy on app development and needed to implement a second new app mid project. We decided as a team that this was a feature we would add in the future as it wasn't available for use from the beginning of the project.

We introduced a second app with updated features and the hospital computer programme mid project. Although this was very exciting for us and a significant milestone, it posed challenges for our final outcomes and their impending timeline. Of our 83 women who have availed of HBPM, some have used the initial app, some used the second app with the computer programme and some women chose to not use the app and instead handwrite their results into their hospital notes. This made it difficult for us to interpret the results. We therefore based the results on the generalised HBPM care pathway rather than individual outcomes for one app versus the other.

The hypertension clinic had the capacity to see 14 women a week, including new patients and follow up patients already using the new care pathway. This was not enough to meet the demands of all the women affected by hypertension in pregnancy at St. George's Hospital (approximately 500 women). As the project lead, I had 10 hours allocation a week to run the hypertension clinic and my remaining hours were my substantial role as a maternal medicine midwife. We tried to add an extra hypertension clinic on an alternative day to correct this issue, but unfortunately

there was no clinic space available to facilitate this.

These challenges left us 17 patients under target for our final report.

Learning

We are very happy that our care pathway will now be embedded into routine practice. I believe this aspect has been successful for us as we had senior stakeholders involved from the beginning, specifically Dr. Asma Khalil and Professor Basky Thilaganathan. We collaborated with the senior consultants in maternal medicine and the maternity assessment unit and had regular meetings to update them on our progress. We also invited midwifery staff to give their feedback. We worked together as a multi-disciplinary team to create the protocols that would sustain the project at a local level. This creates ownership and makes staff feel involved and part of the quality improvement process. I think this was a key step to embedding and sustaining the care pathway.

I think this is a very replicable project that can be transferred to most departments of healthcare. As we are now moving to a paperless future and adopting a telehealth approach to healthcare, this project is relevant and applicable. For example, smart phone apps can be used to communicate with patients about upcoming hospital appointments, results, etc. A similar app could be created for diabetes and blood sugar monitoring and should expect to yield similar benefits as this project has.

Although this was a successful project, there are certainly aspects which we could have done better. I think we could have been more prepared. For example, I would not start the project next time until I knew the app was completed and ready for use. Similarly I would wait until the hospital computer programme was up and running. I would allocate 2 midwives to caseload the women and have 3 midwife led hypertension clinics per week to increase the number of women it is made available to and to provide support to these women throughout the project. I would allocate one day a week as administration for the project to keep up to date with data processing. I thought that I could mix my clinical and administration time with one day a week but this was not successful. I found that all my time was required clinically and I ended up doing administration in my own time. This meant I could not give my full attention to the data collection aspect of the project which I think suffered the consequences as a result.

My advice to others attempting a similar project is to be realistic when allocating time for tasks. There will always be delays with setting up and implementing a new project. If ethical approval is required, make sure to allocate more than enough time for approval. Involve your colleagues and staff as much as possible where applicable as someone will always have an idea on how to improve. The more people that are involved in the project- the more people that will hear about the project.

Part 5: Sustainability and spread

The findings in the preceding sections of this report highlight how important our innovative project is for improving care for women with hypertension in pregnancy. Although it is only in its infancy, we believe that HBPM using a smart phone app can become standard practice in UK healthcare and we fully intend to sustain this innovative intervention beyond the Health Foundation funding period.

Support for the project

From the initiation of this project we have had support from our departmental director and the clinicians working directly with women using HBPM in the specialist hypertension clinic. The project was also recognised on a Trust level as an example of innovative practice in the recent CQC report. The main challenge has come at this stage where we wish to expand the use of HBPM into patients who first present with new-onset hypertension in pregnancy to the day assessment unit (DAU). As already highlighted, these women are then monitored regularly with repeated visits and there is a guideline in place for the midwives and doctors caring for them to follow, according to clinical findings. The staff working in the DAU understandably had some concerns and reservations about introducing a new practice without thorough training and a guideline to follow. Particular concerns were regarding the ownership of patients and who should follow them up and whether the DAU staff would have time to check the app for abnormal BP results on a daily basis.

Action to date

We organised a meeting with all relevant staff including the lead midwife and obstetrician for DAU, the maternal medicine midwives and obstetricians who run the hypertension clinic, DAU and the matron for the department. Here we introduced the app and discussed our results to date. This gave a chance to hear everyone's point of view about whether the app could be used by DAU patients and how this should be introduced. The overall feeling was that the idea was great but that staff wanted a guideline first. It was also decided that patients would be managed and followed up either by DAU or the maternal medicine team depending on who they saw first, rather than mixing between the two. It was also decided that in the first instance, we should only make HBPM available to women with pregnancy-induced hypertension and not to those with pre-eclampsia, due to the higher risk of adverse outcomes with pre-eclampsia. Following this meeting we have devised a guideline for HBPM using the app which is currently in the final stages of ratification and agreed funding from the DAU budget for a further 100 BP machines.

On-going risks and challenges

Once the guideline is in place, we will need to train and support the DAU staff in using HBPM and the app. This is really key to sustaining their faith in the project and we recognise that if they feel unsupported and cannot see that it is beneficial to both them and their patients, they will not continue to use it. We are in the process of creating simple visual aids and instructions to complement the guideline for both staff and patients and we will be present in the DAU in the first few weeks to train and support staff. We will rigorously collect data on outcomes and visits to enable further audit of safety and cost analysis.

Spread beyond the Innovating for Improvement award site

We intend to spread our innovation beyond our site and have already had some interest in this. Dr Asma Khalil is co-chair for the South West London Maternity Network which includes five NHS trusts (St George's, Croydon University, Epsom General, Kingston University and St Helier Hospitals). The network's objectives are to integrate clinical management pathways, disseminate shared learning and promote innovative ideas and it is likely that this is where we first spread and share our innovation. This will be easier if we have an established guideline and evidence that HBPM works in both a specialist hypertension clinic as well as in DAU. We intend to continue our collaboration with Professor Fordham and are meeting in the near future to plan a prospective study of the health economics for this project. This could include other Trusts that start using the app.

Summary

We are now at the stage where we have support from our colleagues to continue the project and a clear plan in place to achieve this. The key milestones beyond the award funding are:

- Share our results and experiences with the South West London Maternity Network
- Initiate HBPM in DAU patients using the telemetry software combined with the app
- Audit and perform a repeat cost analysis

Appendix 1: Resources and appendices

Patient Stories

1.

'This is my second pregnancy at St George's and the service I have been provided with during this pregnancy is far better than my last pregnancy.'

Seeing the same midwife throughout the process has been great. I have a great rapport with my midwife and that gives me as a patient confidence in the midwife's abilities and that I am getting the best treatment which essentially helps me relax throughout the pregnancy.

I believe that if I hadn't been seen by the Hypertension Unit throughout the pregnancy I would have been on blood pressure medication a lot sooner than I was, but by being monitored and monitoring my blood pressure at home I managed to hold off on the medication until the final weeks of the pregnancy.

The service I have received has been hands on, attentive and superb. I couldn't ask for better and for that I thank you and the team at St Georges.'

(Hermione Taylor, pregnancy induced hypertension)

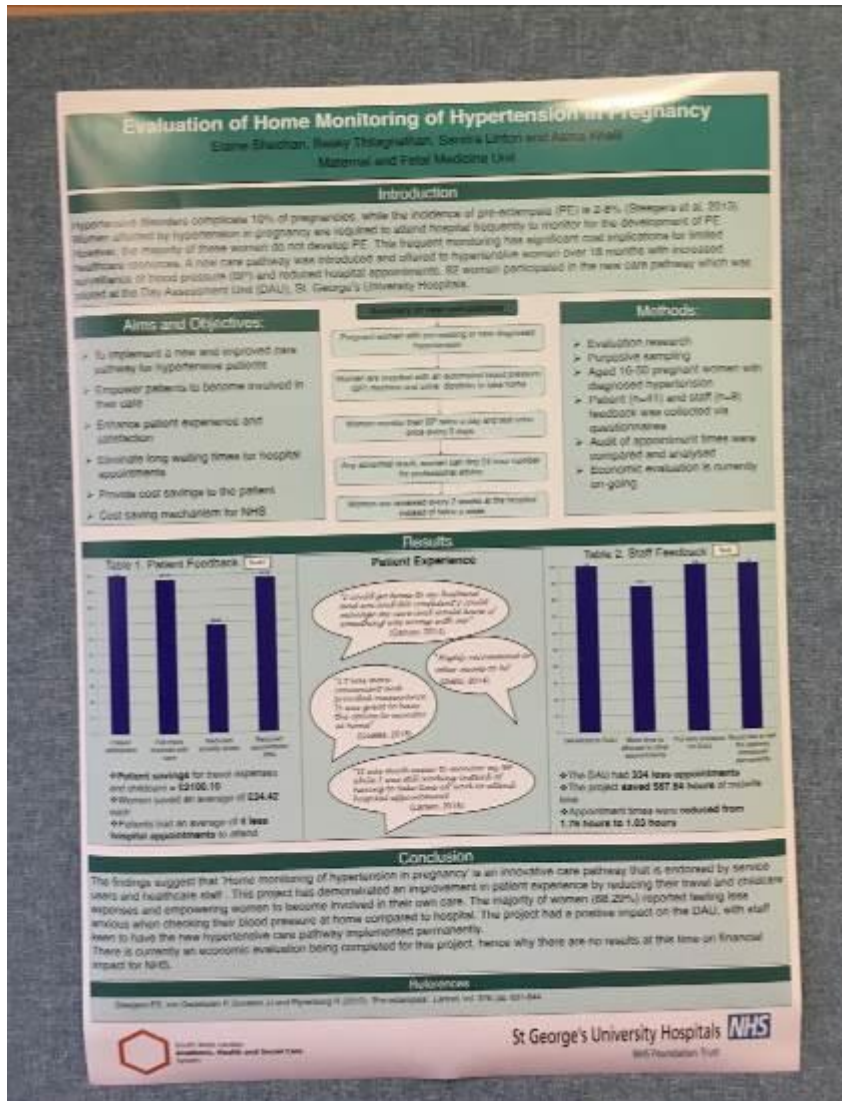
2.

"I would like to thank the team at St. George's Hypertension Clinic who have looked after me throughout my pregnancy. Having a consistent midwife to care for me who knows my background and situation has made all the difference. The care under the hypertension clinic has been exceptional and I would highly recommend the clinic to others and would return here if I have further children. I can't thank you all enough for the support and only hope that the hypertension clinic is still running the next time I am pregnant."

(Lyndsey Denbury, chronic hypertension)

Poster Presentation

The project was selected as the Winner of the Excellence in Healthcare Innovation and Education Awards 2016, St George's University of London (16th March 2016).



Awards

Presentation of award for 'most innovative quality improvement project' by the Principal of St. George's University of London



News

St. George's University Hospital Communications highlighting success of the project

St George's maternal-fetal medicine unit wins innovation award to improve quality of health care for pregnant women

The maternal-fetal medicine unit has been selected by the Health Foundation, to be part of its £1.5 million innovation programme, Innovating for Improvement.

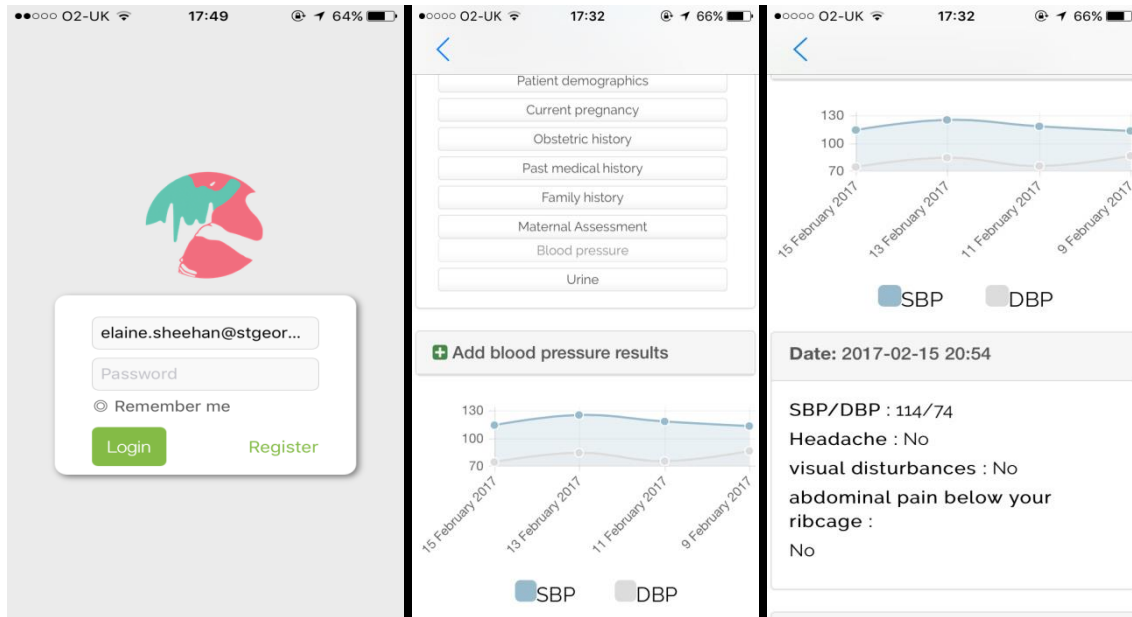
The initiative from the maternity department includes the development of a smart phone app to detect for signs of pre-eclampsia, a life threatening disease in pregnancy. Women will monitor their health at home in between hospital appointments. The app will alert the women if urgent medical review is warranted. This project aims to reduce hospital appointments and encourage women to become involved in their care.

The project is led by Elaine Sheehan, maternal medicine midwife and Dr. Asma Khalil, consultant obstetrician from St George's Hospital.

Gill Clayton, programme manager from the Health Foundation said: "Our aim is to promote the effectiveness and real impact of the teams' innovations and show how they have succeeded in improving the quality of health care, with the intention of these being widely adopted across the UK health service."

The programme will run for fifteen months and has received funding to support the implementation and evaluation of the project.

Screenshots of the current app



How to download the app from apple and Google stores:

1. Type 'Hampton medical' into search bar of app store.
2. Click on first result. You should see the following logo:



3. After download, register your details and your hospital.

Videos of Staff at St George's giving feedback on the Home Monitoring of Hypertension in Pregnancy

Dr Asma Khalil (Consultant and Reader in Obstetrics and Maternal Fetal Medicine at St George's Hospital)



Mrs Jessica Davey (Day Assessment Unit Midwife at St George's Hospital)



Dr Karin Leslie (Consultant in Obstetrics and Maternal Fetal Medicine at St George's Hospital)



Mrs Anita Williams (Midwife Coordinator on Labour Ward at St George's Hospital)

