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SCARU
Self-Care Academic Research Unit

Characterising Extant Technology Related Barriers & Enablers for Streamlined Delivery of BP@home in North Central London

Report for NCL LTC Clinical Network

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Executive Summary

Report objectives

This report summarises the key findings of a place-based evaluation to identify barriers and enablers to the streamlined use of digital tools to support successful implementation of BP@home in North Central London (NCL). Specifically, we characterised the IT landscape in NCL, investigated the views and experiences of HCPs regarding the use of place-based IT solutions and processes, and synthesised a list of evidence-based recommendations for the consideration of NCL leadership team.

Methods

We used a mixed methods research approach and six phases of investigation to address these aims, including desktop research, personal interviews and focus groups, action research, data analysis, synthesis and reporting.

Results

The evaluation showed that there was a lack of standardisation across IT systems, internal processes and templates in PCNs in NCL, leading to challenges in implementing and using digital tools to support BP@home. These challenges were not unique to NCL. AccurX and the locally created NCL template are the most widely used IT tools to support the program in NCL. Other digital platforms being tested in NCL include Suvera, each with unique strengths and weaknesses. Other digital tools, such as Omron Connect, could be considered to support management of hypertension and other chronic conditions. HCPs faced challenges with patient engagement, data quality, IT system integration and resource allocation, but generally felt that the current approach works. Basic requirements for the use and adoption of IT tools and systems include adequate resources, stakeholder engagement, user-friendly interfaces, and interoperability between different systems. We proposed 16 actionable insights and recommendations that could be implemented to help improve the delivery of BP@home in NCL. These include standardising IT systems, improving patient engagement, providing adequate training and support, and promoting the benefits of remote monitoring.

Conclusion

On balance, we recommend that NCL continues to deliver BP@home using the current standard IT offer that facilitates asynchronous engagement with patients (i.e., AccurX). Embedding a quality improvement approach to identify mechanisms to continually improve the BP@home offer in NCL is recommended. Clinical leadership could also review the evaluation findings of alternative tools currently being tested locally (e.g., pilot using Suvera across one PCN) to drive evidence-based commissioning decision as the BP@home initiative becomes even more embedded in routine general practice.

Introduction

Background

The global COVID-19 pandemic resulted in the rapid implementation of a national government policy of shielding to protect vulnerable patients from contracting the disease (1). This meant that shielded patients with uncontrolled high blood pressure (BP) were no longer able to safely access blood pressure monitoring in person, and without monitoring, healthcare professionals were unable to provide tailored interventions to control their blood pressure and medication. In this context, it was estimated by NHS England that a disruption of only 9 months to the delivery of routine care for those diagnosed with hypertension may result in almost 12,000 additional acute cardiovascular events (CVE) including stroke and heart attack or deaths over a three year follow up period (SOP BP@home).

Hypertension is ione of the most readily preventable causes of stroke and other cardiovascular complications and home blood pressure monitoring has been shown to improve blood pressure control among users in comparison standard blood pressure monitoring in the healthcare system (2).

The NHSE-funded BP@Home program was launched in 2020 to address this issue. This program is part of the larger NHS@home initiative which aims to provide more personalised, convenient, high quality and timely alternatives to face-to-face care. This is done by maximising the use of technology to support more people to better self-manage their health and care at home. The focus in the early stages of the BP@home program was concerned with the distribution of BP monitors to participating PCNs and subsequently to eligible patients with known hypertension.

Imperial SCARU's mixed-methods evaluation of BP@home pan-London initiative one year on celebrated the success of the initiative while highlighting key areas that need to be addressed to ensure the programme delivers the intended clinical outcomes in a way that was efficient and sustainable in the context of the currently primary care landscape. Consideration was also given to how the programme could be delivered at scale whilst not exacerbating extant and emergent inequalities.

One area identified as warranting further study identified in the pan-London evaluation relates specifically to the role of technology as a key enabler to support and possibly streamline the delivery of BP@home. In order to efficiently facilitate healthcare professionals (HCP) delivery of the intervention and to ensure the equitable provision of support to patients in self-monitoring,

HCP and patient-facing digital tools and technologies (e.g., AccurX) must be accessible, adaptable and tailored to both HCP and patients' needs and abilities. The use of these technologies should also be congruent for deployment in the

primary care setting, and delivery should be coupled to person centred informational resources that could support onboarding of patients as they enter the BP@home pathway.

To drive evidence-based commissioning decision and to help inform the next phase of BP@home as it becomes more embedded in routine general practice, NCL sought to answer the following key questions:

1. What are the salient characteristics of digital platforms currently used to support patients in BP@home pathway?
2. What IT systems, internal processes and PCN/ICS-wide templates do participating practices use to recall & onboard patients, and to help monitor & evaluate BP@home relevant processes?
3. What are HCP views & experiences of using these IT tools & local processes?
4. How much resources (human, time, financial) must be mobilised to support BP@home at the ICS, PCN, GP practice and/or individual level?
5. Does participation in the BP@home program require more or less resources?
6. Which digital functions currently used to deliver BP@home service would HCPs like to keep and why? What is missing and/or needs improving?
7. Do the current digital tools promote or at least allow to take a population health approach (e.g., risk stratifying patients with hypertension and proactively following up with those at high risk)?
8. What technologies would allow HCPs to process patient data efficiently, so time is used most effectively & patients with the greatest needs are prioritised? What kind of task-shifting / resource reallocation would these technologies require?
9. What placed-based recommendations could we make to promote more streamlined processes for patient onboarding, engagement & routine monitoring of self-reported blood pressure?
10. What steps could PCNs in NCL consider when delivering BP@home to ensure they do not exacerbate inequalities in the population that they serve?

Project aims

The project aims presented below were co-produced by NCL ICB LTCs team (Katie Coleman & Simon Landergan) & the SCARU team (Austen El-Osta & Eva Riboli-Sasco).

Primary aim

Characterise existing barriers & enablers for the successful implementation and use of digital tools to support BP@home (and or other self-monitoring of BP programmes) in NCL.

Secondary aims

1. Characterise IT landscape in NCL, including the digital tools currently used by HCPs and patients in BP@home pathway.
2. Investigate the views and experiences of HCPs as regards the use of place-based IT solutions & processes to deliver BP@home programme
3. Synthesise a list of evidence-based recommendations for the consideration of NCL leadership team.

Methods & Approach

A mixed methods research approach was used to answer the research questions and address aims, combining qualitative, observational, audit and desktop research. The objective pragmatic evaluation was carried out using six phases of investigation and reporting as follows (**table 1; figure 1).** The study received a favourable opinion from Imperial College London Research Ethics Committee (ICREC # 22IC7676).

Table 1: Project delivery using six phases of investigation & reporting

#	Phase	Description
1	**Desktop Research**	Basic readily available information was collected to help identify and characterise extant IT systems, digital platforms & processes in primary care (at GP & PCN level) in NCL
2	**Personal Interviews & focus groups**	Personal interviews and focus group discussions with HCPs involved in delivering BP@home. Potentially eligible participants were approached via email with study information including participant information sheet and consent form and invited to take part. Interviews were recorded & auto transcribed with permission. Contextual data was anonymised and analysed thematically by both researchers
3	**Action Research**	In-person practice visit to City Practice (Old Street, Islington GP Federation) in NCL
4	**Data analysis & consolidation of themes**	Contextual data were used to answer the research questions. We also collected recommendations and requests from respondents regarding the BP@home program and remote blood pressure monitoring in primary care more generally
5	**Synthesis**	Consolidation of emergent themes and synthesis of evidence-based recommendations
6	**Reporting**	This report concludes with evidence-based recommendations of the consideration of commissioners in NWL.

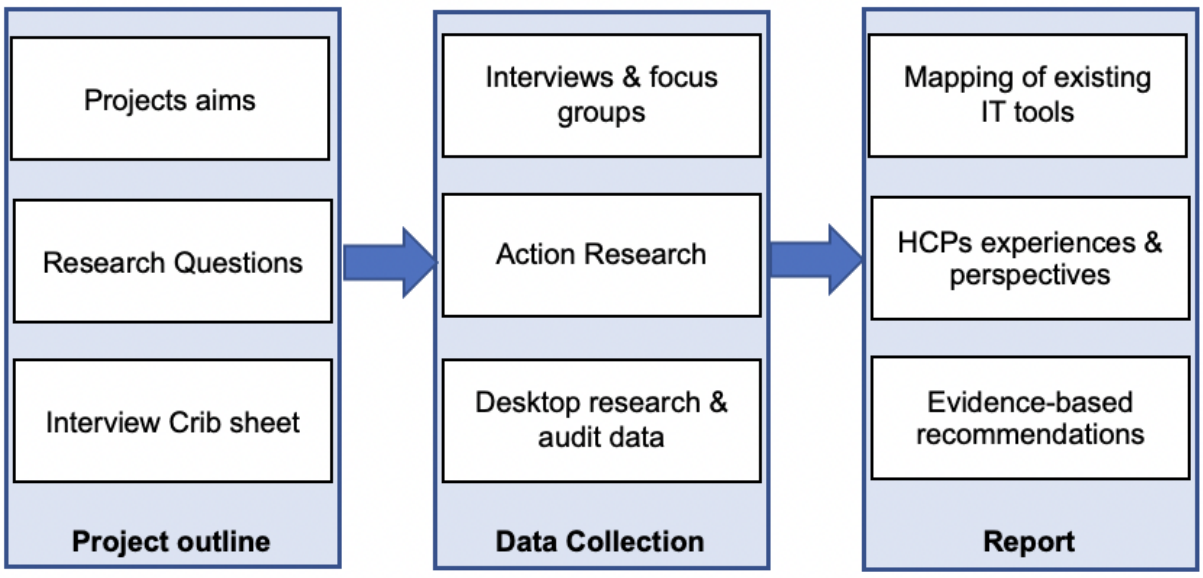

Figure 1: Research process

Findings

Participant characteristics, and details regarding the date and type of interview are presented in **tables 2 and 3.**

Table 2: Designation of respondents, interview date & duration

#	Designation	Date	Type of interview	Duration
1	GP & Clinical Lead	2022-2023	Informal discussion	N/A
2	Programme Lead	2022-2023	Informal discussion	N/A
3	GP & Clinical Fellow for LTCs	21/12/22	Focus Group	55 min
4	GP & Clinical Director	21/12/22	Focus Group	55 min
5	Practice Nurse Manager	21/12/22	Focus Group	55 min
6	Senior Clinical Pharmacist	21/12/22	Focus Group	55 min
7	GP & Clinical Fellow for LTCs	26/01/23	Personal	45 min
8	Clinical Pharmacist	02/02/23	Action Research / practice visit	120 min
9	GP & Digital Clinical Lead	15/02/23	Focus Group	47 min
10	Clinical operations lead	15/02/23	Focus Group	47 min
11	GP	15/02/23	Focus Group	47 min
12	Operations lead	15/02/23	Focus Group	47 min

Table 3: Participant characteristics

-	N	(%)
Total	12	(100)
Gender		
Female	6	(50.0)
Male	6	(50.0)
Employer		
NHS	10	(83.3)
Private sector	2	(16.7)
Designation		
General Practitioner	6	(50.0)
Clinical Pharmacist	2	(16.7)
Practice Nurse Manager	1	(8.3)
Non-medical profession (admin, management)	3	(25.0)

1. IT systems, internal processes & local templates

Table 4 presents an overview of the stepwise processes involved in delivering BP@home, with slight variations between different catchment areas.

Table 4: BP@home processes (IT-relevant items highlighted in green)

	Enfield	Camden	Islington
Invitation	• phone & SMS	• email, SMS & phone	• Face-to-face (F2F)
Onboarding material	• Preset sms with links to videos & articles	• SMS & webpage with links & info	• Accurx Florey, BP@H videos + diaries
Onboarding agent	• admin, pharmacists, GP	• nursing associates, clinicians	• Nurse. Pharmacist, Healthcare attendant (HCA), Trainee Nursing Associate (TNA)
Demo of BPM use	• video link, some F2F when collecting BPM	• links, F2F by TNA / HCA when needed	• NA
Demo of how to record readings	• no - they only get the prompts in the Accurx Florey instructions	• No – unless help is needed (patient centred)	• Yes, demo by HCA/TNA using AccurX Help Centre screenshots
Use & integration of SMS messages into EHR	• AccurX templates, saved into EMIS • Suvera in 1 PCN (only since Jan 2023)	• AccurX 4-day templates, coded into EHR • created SMS templates for responding to results when they come in	• AccurX 7-day templates
Tier group specificities	• affects order of contact for onboarding • frequency of follow-up based on patient engagement, BP levels & required interventions	• See frequency of communicating readings below	• Patients who need change in medication may require longer monitoring
No. of readings requested	• 8 or 14 readings depending on PCN	• 8 readings: twice a day for 4 days	• 14 readings: twice a day for 7 days
Frequency of communicating readings	• every 6m if normal • if not, report after 1m from clinical intervention until control is to target	• monthly if treatment changes • every 6 months if under control • but encourage to monitor every 3 months	• Florey submission at end of the 7 days but red flags if BP too high to contact sooner
Channel	• AccurX or paper • Suvera in 1 PCN (only since Jan 2023)	• paper at reception, AccuRx, email of excel spreadsheet, eConsult	• Accurx (majority), paper, email
Follow-up with non-respondents/ patients who do not submit readings	• Mostly call or SMS by admin (or Suvera in corresponding PCN)	• Call by care coordinators to identify barriers & support patients to engage • For some, return of BPM & to 'old fashioned' methods of care	• Follow up call is scheduled when given monitor for 10-14 days later to either discuss or chase readings
Metrics recorded for tracking	• Monitors distributed • Patients onboarded • Patients on pathway who have submitted a first BP reading		
BPMs distribution rationale	• Weighed allocation based on the combination of number of hypertensive patients & deprivation score		

Diversity of processes with a common goal

Table 4 highlights that there are differences in the choice of tools and processes within NCL. This diversity is found also within boroughs as described by one respondent:

> *"Of the five PCNs [in Enfield], I think there are probably 5 different ways of approaching this. But one thing that has been good is that each PCN is generally doing the same thing* [which] *helps in terms of keeping things streamlined and standardised*

All of these processes, albeit slightly different given local innovation, are derived from the BP@home SOP, and serve the same overall goals:

> *"Identifying who are our at-risk priority patients and (…) and seeing how we can approach these patients in order of priority in order to try to educate them a little bit more about blood pressure but primarily engage them in self-management and self-monitoring at home. And how can we equip practices to be able to support with that process (…)*

Ubiquity of IT tools and systems along BP@home pathway

Also, as evidenced through the highlighted cells, the use of digital tools (AccurX, SMS, online resources) happens at all stages of the process and in all boroughs, despite minor variations. Low tech options such as phone calls or pen & paper however also remain essential complements as back up options to limit exclusion of patients with limited digital access and/or literacy.

It appears that most PCNs in the 5 boroughs are using AccurX to contact patients and receive readings which are then automatically saved into the EHR (EMIS or SystmOne). However, the Enfield Southwest PCN which groups 6 practices very recently (mid-January 2023) opted for Suvera, after considering Omron Plus. The next section presents the main features of these IT tools.

2. Salient characteristics of digital platforms for remote BP monitoring

The most commonly used IT tool to support BP@home within NCL is AccurX. Their main product is chain SMS which can be used by GP practices to communicate with their patients. One PCN considered switching to Omron Plus but eventually opted for another platform (Suvera). The short description and main services of these 4 tools is presented in **Table 5** below (see **Annex A** for additional tools used in the UK).

Table 5: Salient characteristics of IT platforms used for BP@home

Name	Description	Main functionalities / Services	Locations
AccuRX	British software company. Runs on desktop computers & sends text messages. Integrates with EHR (SystmOne & EMIS). Most used tool in England, including NCL.	• Chain SMS used by GPs to communicate with patients • Medical surveys • COVID-19 vaccine booking • Digital documents (PLUS) • Text & Photo response (PLUS) • Video consulting (PLUS) • Remote Patient Triage (PLUS)	All PCNs across NCL
Whizz Health	US based company. Mobile application for individuals to aggregate, organise, & share their medical records on a blockchain. Offers secure management tool for all health data gathered from wearables, EHR Systems, Doctors & Medical Labs.	• Upload/download health data from various sources, including wearables, lab reports, doctor & hospital visits • Share healthcare records with physicians, personal trainer, or for research; Design health challenges & track progress	Pilot test in Haringey
Suvera	British software company. Virtual care provider supporting condition management for patients. It combines a virtual care team and technology to reduce the number of appointments required to manage patients with chronic conditions while improving access to better clinical outcome.	• Chain SMS to onboard patients & schedule appointment • Submit & receive readings • Access to Suvera's clinical team via phone call & SMS • Dashboard summarising all health data • Practical lifestyle advice & support for patients • Community support between patients	Pilot test in Enfield South West PCN
Omron Connect	OMRON Healthcare Group is headquartered in Kyoto, Japan. OMRON Healthcare Europe B.V. is the healthcare division for Europe, Russia, Middle East and Africa and provides service to customers in more than 74 countries. Its no.1 product are digital blood pressure monitors. The app wirelessly collects measurement data from any OMRON connect compatible devices & dashboard for viewing recent measurements & tracking progress	• Self-tracking app • Downloadable reports to share with GP • Connects with main activity tracking apps • Atrial fibrillation detection (Premium) • Medication tracking & customised reminders (Premium) • Health rewards: using the tracking features you earn points that can be redeemed for gift cards. more detailed, easy-to-understand insights into the data you record (Premium)	Not currently used in NCL (Initially considered in Enfield South West)
Other tools are being used routinely across the UK to help with the delivery of BP@H, including: • **Qardio:** wireless BPM that connects to a mobile app, allowing patients to track their BP readings and share them with healthcare professionals. • **Withings:** range of connected health devices, including BPMs, that integrate with the Withings Health Mate app to provide personalised health data and insights. • **Patients Know Best:** patient-controlled personal health record platform that allows patients to share their health data with healthcare professionals and manage their care remotely. • **Doctaly:** A telemedicine platform that allows patients to consult with healthcare professionals remotely, including for the management of hypertension and other chronic conditions • **OneContact:** suite of remote monitoring & communication tools that allow clinical reviews to be undertaken remotely & enhance communication between patients & HCP • **Huma / Menopad;** integrates health data from existing hospital databases as well as patient wearables & other mobile devices & securely transmits it for use by GPs • **MJog;** modular patient messaging solution that helps practices and clinicians engage with their patients • **MyHeart; p**ersonalised self-management & cardiac rehabilitation programmes for patients with heart disease or recovering from cardiac surgery		**Not in NCL**

3. HCP perspectives & experiences regarding IT tools

Respondents shared their perspectives on the use of AccurX, Suvera as well as a locally designed template aimed at providing GP practices with guidance and recommendations for tracking BP monitors and patients. **Table 6** summarises the feedback gathered during the interview regarding some of the existing IT tools either used or considered in NCL (complete version with quotes in **Annex B**).

Table 6: Benefits, limitations & recommendations regarding IT tools used within NCL for BP@home

IT tool	Benefits	Limitations	Recommendations
NCL template	• Based on SNOMED codes • Allows tracking of devices • Facilitates follow up with patients • Provides guidance for task sharing/shifting • Facilitates data sharing at ICS level • Seems appreciated by HCPs • Fills a void	• template sits separately / using it is a choice • no specific SNOMED code for BPM loaning • record keeping difficult to maintain / still requires lot of admin work • by initial 3 months evaluation, templates hardly being used	• Simplify template • Reduce to 2 main codes: tracking of BPMs and tracking of patients readings • include links to the resources that people need & provide clear instructions
Accurx	• Familiarity / already in place • Easy to use • Very well integrated into EMIS, sits on desktop, links to emails • Responsive to GPs requests • Creation of a specific Florey for BP@H which allows follow up with patients • Possibility to set up templates & include health advice within SMS	• Requires relatively high levels of digital literacy / access • GPs still in charge of the follow up, no automated tracking • Does not provide patients with summary of readings • Numerous messages may create confusion • Link to provide readings automatically expires after 4 or 7 days • Cost (used to be free)	• Unlimited validity of links to provide readings • Offer simple SMS and pen/paper option for those who do not have access to internet or a smartphone
Suvera	• Analyse data & provides risk stratification by prioritising which patients need to be contacted first • Contacts the patients & manages income of BP readings • Both a management team & a clinical team behind it • Takes on a bigger load of the work than other tools • Higher engagement of patients thanks to active clinical follow up	• Tested only in 1 small PCN (6 practices) and few PCNs outside NCL • Very recent (switch mid-January 2023) • Higher cost which requires shifting resources away from other allocations • Lack of transparency / insight into performance	• Review in April to see whether it works & consider extending to other PCNs

A diversity of tools with specific advantages & limitations

> *"AccurX is very easy to use. Patients don't need to be software savvy because it comes as a text message on the phone. They do need Internet though if they're going to access the Florey (…) But it's very easy to use.*

> “***Omron*** *is a little bit more all singing all dancing because the patient can track their results on the app so there's more follow up and there's a bit more interaction between the clinician and the patient so it's less rigid in that way.* ***Suvera*** *is the step even further where you get this management team and clinical team behind it*

According to another respondent, one of the main advantages of **Suvera** is that:

> “*They have their own workforce and GP supervisors so (…) I can hand over more to them than I would through another process*

This tool therefore takes a bigger part of the workload than other tools:

> “*[**Omron Hypertension Plus**] is a platform with more AI and automation of suggested decision making [than AccurX]. It provides you with the platform, but you still need to use your own clinicians to handle the process and take the suggested actions*

Finally, while still imperfect the **NCL template** filled a void and was therefore very much appreciated by some of the respondents:

> “*Without [the NCL template], it would just have been an absolute nightmare because there was nothing in place at all when we started doing this.*

Main drivers to the adoption of new tools

While most respondents overall expressed satisfaction with AccurX, they also stressed the fact that learning and adoption of new tools and processes is constant and despite potential push-back, alternative tools, especially if those were cheaper, would be adopted:

> “*If someone comes along with a much cheaper offer then I think NCL or other ICSs will commission it and primary care will have to learn to use a new system. And I don't actually think that that is a barrier because we learn to use new systems all the time. It will get pushed back, people will complain, but it will happen, and people will learn a new system. So in the end, it just comes down to money*

In addition to the attractiveness of the financial cost, and technical efficiency of the IT tool or system, another important driver to the adoption and use of such product by HCPs relates to the company’s responsiveness to their requests:

> “*I'm sure any company with the technical skills and who's listening properly to GPs could produce something else.*

4. General BP@home challenges identified by respondents

In order to best understand the perspectives of HCPs regarding digital tools, it is important to contextualise them by presenting the general challenges and barriers experienced and identified by respondents along the BP@home pathway, as well as the drivers and strategies put in place. These are summarised in **Table 7** below (complete version in **Annex B**).

Table 7: General BP@home barriers & challenges identified by respondents

Categories	Themes (challenges)	Description
(1) Engagement of PCNs & practices	**1. Differential capacities**	• Some PCNs group practices not used to working together • No financial incentive except BPMs • skill sets vary from practice to practice
	2. Substantial additional workload	• Storing, tracking, management of readings might put off practices
	3. Lack of financial incentives	• No additional funding • BPMs as only financial incentive
(2) Engagement of patients	**4. Requires chasing**	• Keeping them engaged is a challenge • Requires a lot of chasing
	5. Differential digital access & literacy	• Older and/or economically deprived patients might not have access to smartphone and/or internet
	6. Equity concerns	• Unequal distribution of BPMs might reinforce existing inequalities • Issues with digital access & literacy might exclude at-risk patients, especially elderly and most deprived
(3) Project Management	**7. Shifting directions & waste of funding**	• Part of funded staff time lost due to changes in directives • Fellows had to find alternative funding (inequity programs for example)
	8. Lack of guidance	• SOP insufficient for immediate implementation
	9. Top-down approach	• Limited influence of HCPs on processes
	10. High staff turnover	• Loss of organisational memory • Requires constant re-training of new staff
(4) Logistics	**11. Storing & distribution of BPMs**	• Complications & delays • Unequal distribution to PCNs • Waste of clinician's time
	12. Tracking of BPMs	• Very time consuming • Limited tracking of BPMs means some might be distributed but never used
	13. No unified IT template & diversity of communication channels	• Locally created NCL template fills a void – nothing existed before • Diverse communication channels required to communicate readings to avoid excluding patients • Multiplicity of resources available can be overwhelming for GPs

Respondents expressed **13 main challenges across four main categories**: (1) engagement of PCNs & practices, (2) patient engagement, (3) project management and (4) logistical.

(1) ENGAGEMENT WITH PCNs & PRACTICES

Several barriers were identified regarding the recruitment of the PCNs and practices, among which their differential capacities and resources for engagement:

> *"PCNs are very variable beasts. In some areas a PCN is a group of practices working very, very closely together and I think, then you can get a whole program out across the PCN, but actually in a lot of places PCNs are a bunch of practices forced to work together in order to get their funding streams in, but they're not actually really working together*

> *"Skill sets vary from practice to practice.*

In addition, participation in the BP@home programme required substantial additional workload (in terms of storing of BPMs, data management, etc.) with *no direct funding:*

> *"The only financial incentive for this is actually getting the monitors. There's no financial gain for a PCN, and that's why it's such a huge sort of issue, because PCN's are looking at well as this project going to make us money*

(2) PATIENT ENGAGEMENT

Regarding patients, the 2 main challenges related to keeping the patients engaged on the long term and not excluding those with limited digital access and/or literacy:

> *"My experience is that we can get monitors out to patients and we can get them to give us some readings some of the time and not all of the time. And then it's another big piece of work to keep them engaged in that (…) move towards BP at home being a thing that the patients are prompting*

> *"The remote monitoring requires the patient to at least have a mobile phone. So we have some older patients (…) or actually patients who maybe are from the slightly more deprived backgrounds who have mobile phones but don't have Internet access on their mobile phone. (…) So we did have a cohort of patients who don't wanna use Floreys for whatever reason. They either got confused using a Florey or they didn't have Internet access or their mobile phone was a more basic mobile phone without Internet access.*

(3) PROJECT MANAGEMENT

Respondents expressed some confusion and frustration due to shifting directives in the project which they think led to a waste of time and resources:

> *“ It started with being a project about working with UCLP. It then sort of got honed down to a project about hypertension. So a lot of the time, actually the funded time was lost doing other things before somebody decided this is what they wanted us to do*

The original BP@home national SOP, while useful, was also considered by some as insufficient and still requiring substantial work:

> *“ We spent probably about four months in fortnightly meetings discussing and tweaking and getting a plan everybody was happy with before we launched. (…) so we did spend quite a lot of time drilling into the logistics of how specifically this is going to work.*

Respondents also commented on the high rate of turnover which required constant training of new recruits and contributed to *the organisational memory getting lost.* Finally, the BP@home program was perceived especially by HCPs involved at practice level as being too top-down and not responsive enough in its approach:

> *“ I feel that I've had very little ability to influence things at an NCL level. You know, we've had lots of frustrations with the delays and the BP machines and no matter how many times we've kind of raised those concerns, nothing has really changed.*

(4) LOGISTICAL

The delivery, storing and tracking of BPMs appeared as a central and recurrent issue across PCNs and practices:

> *“ The hassles that we've had about getting monitors to practices and where they're going to store hundreds of monitors and that process has been a bit of a disaster and continues to be a bit of a disaster.*

> *“ So here come 3000 monitors. But then we had a very short window of time. Where are we going to put all these monitors? So trying to then coordinate between different practice sites that you're gonna have all this massive storage of monitors. And actually, there's now like 2 office rooms at the federation that are just chock full of monitors.*

> *“ Practices do not have the manpower or infrastructure to keep an accurate log of them.*

The tracking issues raised concerns regarding a potential waste of resources:

> *“ I suspect the biggest problem is going to be that we've got is it 16,000 monitors across NCL and a lot of those are going to disappear because of the way it's managed. (…) I'm worried about the investment that's gone into this*

Finally, the lack of a unified IT template and tools, disparate resources, and necessity to maintain a variety of communication channels to fit each patient was reported as another important issue:

> *“ One of the issues we currently have is perhaps too much choice in too disparate ways. So, by that I mean if we're onboarding patients and we're giving them a choice of ways to give us blood pressure readings, each practice having to kind of work out, how do they make that available for their staff. So you know each individual doctor might have a link to the printable blood pressure diary to give to a patient, but some of them don't have that and they don't know where to find it*

5. General recommendations & strategies devised by respondents

In response to the barriers and challenges identified in the previous section, respondents described numerous strategies and drivers already in place both at PCN and practice level, and also devised several recommendations for the future of BP@home and remote BP monitoring in general. These are summarised in **Table 8** below (complete version in **Annex C**).

Table 8: General recommendations & strategies devised by respondents

Categories	Themes	Description
(1) Engagement of PCNs & practices	**1. Additional funding**	• Already stretched system: additional work requires additional funding • Use alternative funding (e.g.: Equity funding)
	2. Internal needs assessment & training	• Needs assessment and training to make up for differential capacities between practices
	3. Clinical targets as incentives	• Tie participation in program as a way to achieve QOF & LTCs goals
(2) Engagement of patients	**4. Person-centred care**	• Present participation in BP@H as a gain for patients rather than GP practice projects, explain importance of BP tracking & support general self-management • Customise frequency of contact & avoid patient fatigue by reducing requests of readings for those who have good results for e.g. Only once every 6 months or once a year while supporting those at-risk/less engaged
	5. Maintain non digital options for patients	• Some patients with limited digital literacy and/or access will still need alternative options for communicating their results (pen & paper, phone call, etc)
(3) Project management	**6. Centralisation at practice & PCN levels**	• One person per practice with allocated time & resources to BP@H in charge of onboarding, follow-up, etc • One person at PCN level guiding local teams (e.g.: NCL LTC clinical lead)
	7. Task-sharing focused on LTCs at PCN level	• Task-sharing between different actors such as LTC clinical lead, lead pharmacists, reception representative & PR person who can advise and liaise feedback relative to their specific role
	8. Incorporation into daily practice & reverse-thinking	• Make it part of the day-to-day long term condition reviews (not a separate project) • Practices should anticipate and devise process & responsibilities for data/readings reception, follow up with patients and tracking prior to entering the program
(4) Logistics	**9. BPMs on prescription**	• Would become a routine part of managing hypertension • Would give patients more responsibility for the machine • May improve the balance of who gets devices
	10. Simplified templates & IT system	• Streamline processes & resources, simplify template • Identify a simple way of tracking BPMs & patients • Use UCLP tracking recommendations for tracking metrics
	11. Role of pharmacists	• Well placed to advise on logistics & liaising with patients (communication, double-check readings, motivation, etc)

Respondents presented **11 main drivers and strategies** - devised as responses to the challenges presented above - **classified into four main categories:** (1) engagement with PCNs & practices, (2) engagement with patients, (3) project management and (4) logistics.

(1) ENGAGEMENT WITH PCNs & PRACTICES

Adequate funding was a presented as a central driver to the engagement of PCNs, both through the identification of alternative funding (for Equality for example) but also more importantly as a specific financial support for BP@home:

> *"Work like this is very difficult to implement without funding (…) a lot of the work that's expected to be done is sort of out of an already stretched system that doesn't have capacity. So projects like this just need to be adequately resourced*

Another suggestion in terms of incentive was the use of the Quality Outcomes Framework (QoF):

> *"Right from the beginning, the incentives were the important part because that was the way to try to get practices on board (…) For example, QoF: so we could demonstrate how this is gonna help them to reach their QoF targets. Great. That's a big tick. The other one is a locally commissioned long term conditions service already in place. They were in year two of their cycle and they had some very tight hypertension goals that practices had been struggling to achieve. So there we could say, OK, look, you're trying to achieve this for your blood pressure. Here's where you are so far. What if we can get you here by trying this method and then they're happy to try*

Faced with the differential skill sets between practices, one PCN opted for an internal needs assessment followed by training:

> *"Skill sets vary from practice to practice. So we did a little bit of a needs assessment with the PCN and said: what do you think you're gonna need within your practices? There were some places where the pharmacists were quite junior, so we did some specific training with the pharmacist, had a few sessions with them before the patient launch so that they felt competent to go ahead. They knew what to do. We did a lot of role-playing that sort of thing. The receptionist representative did some training with reception team, so we standardise materials that were sent out to all reception teams across the practices. And then she did some sort of follow up training with them so that they felt comfortable how to approach the patient.*

(2) ENGAGEMENT WITH PATIENTS

Offering a more person-centred care could be an important driver to patients' engagement. In the case of BP@home, this came up in terms of better explaining to

the patients the personal benefits of remote monitoring of their BP as well as customising the frequency of contact to each patients' BP status:

> *"Patients have to understand why we're doing it and that is not just a thing the practices is asking for the benefit of the practice. They need to see that it's personally helpful for me to understand my blood pressure and to have this engagement and interaction with the clinician.*

> *"What we did was build in a feedback loop with the Florey so that if their blood pressure was to target then we said OK, you don't need to do this for another 12 months and we automated it (…) because we don't want patient fatigue. If they're being asked to do something all the time and they keep getting told, it's fine, at some stage they may well just give up. Plus, it's not that useful clinically if they are well controlled*

Another important recommendation to avoid excluding patients with limited digital access and/or literacy was to maintain basic and possibly non digital options such as pen & paper to communicate readings, and SMS for initial contact.

(3) PROJECT MANAGEMENT

Key recommendations in terms of project management included having a named person both at practice and PCN level coordinating BP@home:

> *"Where you can have a centralised key person who kind of knows the project inside and out, and is plugged into local teams and able to support them where their need arise that really I think is the big key*

Task-sharing between different specialties focused on LTCs came up as another driver in one of the PCNs:

> *"They have a long-term condition clinical lead who is a GP and then that GP has a team that they work with. So there's a lead pharmacist for long term conditions alongside a computer IT guru who is just for long term conditions. So that was brilliant and really helpful. We had a reception representative. So she was feeding back all the queries and concerns from a front facing reception point of view*

Many respondents recommended the incorporation of BP@home in daily practice, rather than as a special, separate project:

> *"I would say that we make this part of our everyday consultation, and this hasn't seen as an added project. This is seen as something that we incorporate into our day-to-day long term condition reviews*

Finally, one respondent suggested a an approach based on reverse-thinking to guide local processes:

> *“ for this to be successful actually practices need to start at the end of the process, not at the beginning. And what I mean by that is every practice that wants to engage with supporting BP at home needs to solve the problem of how will their data come in? Who will manage it and what will happen when the patients’ blood pressures are not well controlled and that's actually the first step of the process.*

(4) LOGISTICS

Offering BPMs on prescription was a central, recurrent recommendation among HCPs as a way to promote equitable access and also promote a sense of responsibility among patients. Another central recommendation was the simplification of the NCL template and other IT systems:

> *“ we've brought together quite a lot of resources, but actually it would be quite nice to have them much more streamlined and easily available. Maybe adapting the template and simplifying it, but with links to the resources that people need so you know a simple letter that explains to the patient how to do this (…) It is quite a lot of different bits and pieces and maybe somebody with a really good head for simplifying things could bring it together*

> *“ If someone can come up with a system and very simple way of monitoring where our blood pressure machines go, so then we can keep recalling those patients that would be great.*

Finally, one respondent emphasised the role of pharmacists in liaising with patients and devising logistics:

> *“ the pharmacist were very good at thinking about the logistics of how the review is gonna take place in the consultation. How will we know that the patient has had the right size cuff? How will we know that the patient is taking the blood pressure readings in the way that we want them to? So making sure that we had good information going out to patients in the initial messaging that went out and the batch messages, but also that we had a check process, so that all the clinical pharmacists were in the PCN knew to double check with the patient so when a patient’s readings would come in, they would be allocated an appointment to phone that patient to discuss the results.*

> *“ The pharmacists are amazing. So if you can get your pharmacist on board, they're brilliant at motivating patients as well as making sure that data is being recorded in the right way so that it's useful for them, for your IT people to pick up things on their searches and things like that. So I think that's really important.*

6. Mind map of BP@home processes in NCL

Figure 2 presents in a graphic form the interrelationship between the main challenges & barriers and the strategies & recommendations to mitigate them. Items relevant to IT systems and digital tools are circumcised in red.

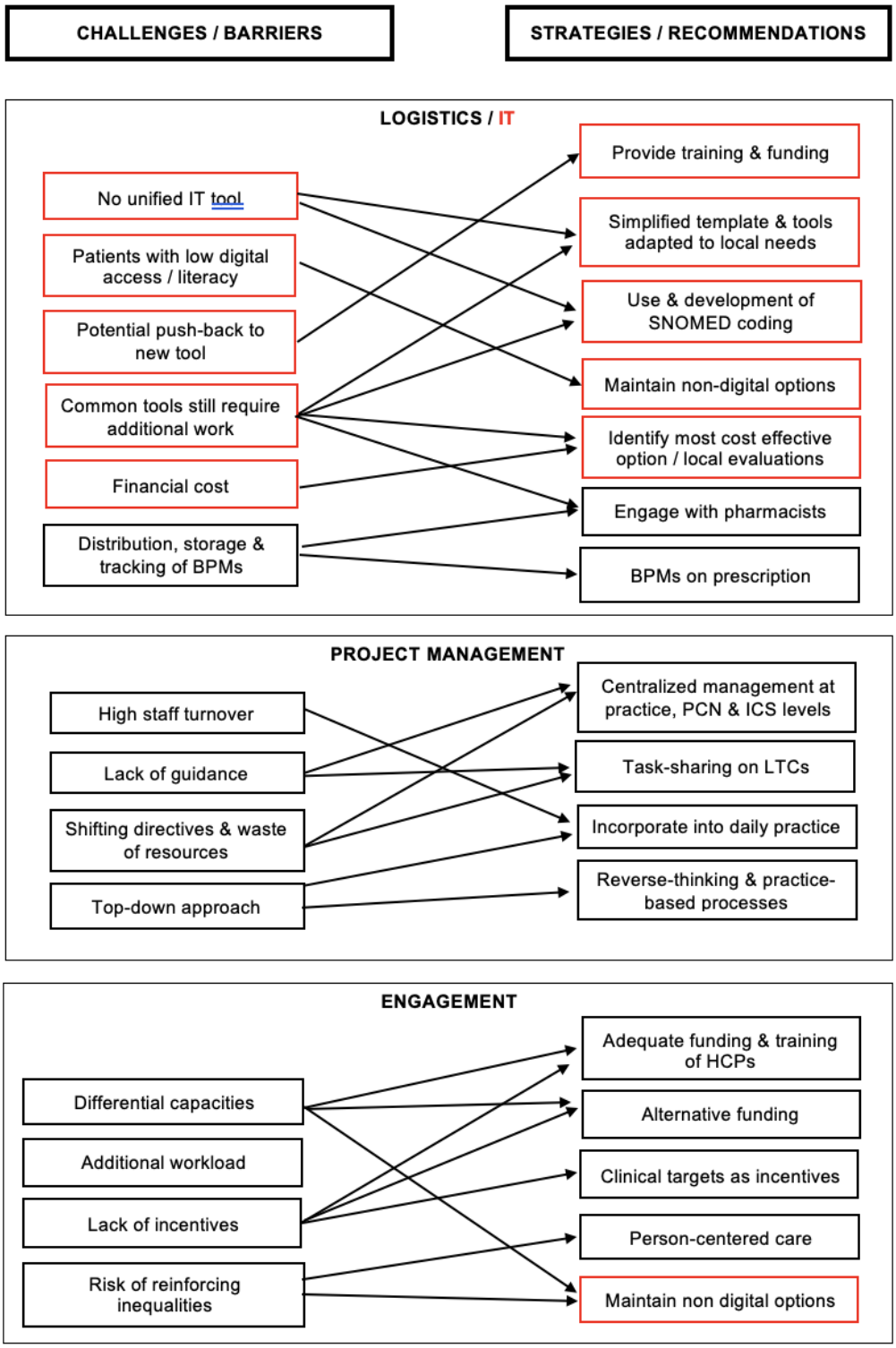

Figure 2: Mind map of BP@home process in NCL

7. Cross-cutting challenges & requirements for the adoption of IT tools & systems

Following the above findings, we identified and summarised the main challenges and barriers to the use and adoption of IT tools & systems as well as the drivers and basic requirement for any tools to be used to support BP@home, and remote BP monitoring in general (**table 9**).

Table 9: Cross-cutting challenges & enablers for use & adoption of IT tools & systems

Barriers / Challenges	• Most of the tools still require additional work from HCPs • Lack of unification, multiplicity of options and tools required to fit each population / disease • Necessity to maintain non digital options to avoid excluding patients with limited digital access / literacy • Adoption of new tool might initially create push-back. • Lack of time & training • Lack of transparency / access to patients • Financial cost: investment in digital tools requires cutting or lowering on other expenditures (including HCPs posts)
Drivers / enablers	• Provide adequate training to HCPs & patients • Easy to use • Integrated into the EHR • Unified across PCN/ICS • Cover multiplicity of conditions/target populations • Support population health approach through risk stratification & equity promotion • Accessible to patients with low digital access/literacy by maintaining phone, pen & paper and/or in-person option • Adaptive & receptive to HCPs requests • Can demonstrate better engagement of patients • Decrease amount of work required from HCPs • Streamline process • Adequate follow up & feedback to patients • Accessible summary of health data for both patients & GPs

Discussion

The BP@home programme is an excellent example of self-care using task-shifting approach (3). This section provides a summary and interpretation of the research findings presented in the previous sections. It explores their implications for the successful implementation and use of digital tools to support self-care measurement (4) in the context of BP@home, and the broader context of digital transformation in healthcare and areas for future research and development to improve the delivery of remote blood pressure monitoring in primary care.

Summary of main findings

Table 10 below summarises the key findings of this evaluation and provides a brief response to each research question.

Table 10: Summary of main findings/response to each research question

	Research Questions	Summarised Answers
1	**What are the salient characteristics of digital platforms & tools currently used to support patients in BP@home pathway?**	• **AccurX** supports communication with patients, integrated to EHR, easy to use, responsive & adaptive. • **Suvera** supports communication, analysis & self-tracking/management, provides higher support • **Wizz Health** aggregates, organises & shares patients' medical records & health data • **NCL template** supports tracking of BPMs & patients via SNOMED codes
2	**What are HCP views and experiences of using these IT tools & local processes?**	• **AccurX:** familiar, integrated, easy to use, responsive • **Suvera:** promising but needs to be tested • **NCL template:** very useful but requires additional work
3	**How much resources (human, time, financial) must be mobilised to support BP@home at the ICS, PCN, GP practice and/or individual level?**	• **PCN/practices:** substantial admin work, chasing of patients, storing, distribution & tracking of BPMs, training. Financial cost of IT tools being used. • **Patients:** high level of digital literacy & access to internet, dedicate time to record & communicate readings
4	**Does participation in the BP@H program require more resources?**	• Yes, it requires additional resources at many levels (human, financial, training, time).
5	**Which digital functions currently used to deliver BP@home service would HCPs like to keep? Why? What is missing or needs improving?**	• **AccurX** appears to be quite appreciated by respondents. Issues with link expiration • **NCL template** needs to be simplified • Additional **SNOMED codes** for tracking BP@H
6	**Do the current digital tools promote a population health**	• Not really, this remains the task of HCPs. **Suvera** offers a risk stratification of patients, but it remains to

	approach?	be evaluated
7	**What technologies would allow HCPs to process patient data more efficiently? What task-shifting/ resource reallocation would this require?**	• Simplified template • Better training & communication on available IT tools • Explore the use of alternative tools such as Suvera which provide higher level of support (including tracking and follow up with patients)
8	**What placed-based recommendations could we make to promote more streamlined processes?**	• One named person per practice in charge of BP@H & one coordinating at PCN level • Involving pharmacists to devise logistics • Task-sharing between specialty leads focused on LTC
9	**What steps could NCL consider ensuring they do not exacerbate inequalities in the population served?**	• Offer BPMs on prescription • Involve pharmacists to liaise with patients • Maintain non-digital options

Critical appraisal of digital platforms currently used in NCL

Digital tools can streamline the delivery of the BP@home programme in NCL by reducing the need for in-person visits to healthcare facilities, saving patients time and reducing healthcare costs. Tools like AccurX are commonly used across the UK and in most ICS in London can support asynchronous communication between HCPs and patients by sending requests to patients to take their blood pressure readings, and integrating the readings sent directly into their EHR.

The use of asynchronous communication tools allow GPs to monitor their patients remotely and intervene if necessary, thus helping provide more targeted and timely care to patients with high blood pressure, whilst improving patient outcomes and reducing the burden on the healthcare system. Some digital tools can also provide patients with access to their summarised data, personal recommendations and thus engage them more actively in their own care.

Tools like Omron Plus or Suvera for example provide patients with real-time feedback on their blood pressure readings, which can help them make lifestyle changes to improve their blood pressure control. While these tools may relieve HCPs from a more substantial part of the workload, they also have a higher financial cost and may therefore require cuts on other spendings. In addition, they add another intermediary in the relationship between HCPs and patients. **Box 1** highlights the desirable characteristics of IT solutions for use in BP@home.

Box 1: Desirable characteristics of digital tools to support remote monitoring

1. Be easy to use, work with & learn (through training sessions, printed and online material)
2. Offer streamlined integration with EHR
3. Be unified across PCN & possibly the whole ICS
4. Cover multiplicity of conditions & target populations
5. Support a population health approach by providing a risk stratification of patients & promoting equitable and accessible services
6. Be accessible to patients with low digital access/literacy by maintaining phone, pen & paper and/or in-person communication options
7. Be adaptive & receptive to users' (both HCPs & patients) requests
8. Support quantifiable broader & more sustained engagement of patients
9. Decreases amount of work required from HCPs
10. Provide accessible summary of health data to both patients & GPs

Recommendations for the consideration of clinical leadership in NCL

Further to the 12 recommendations presented to LCEG in August 2022 following pan-London evaluation (**Annex D)**, a list of 16 recommendations is presented in **table 11** for the consideration of NCL leadership team. These recommendations were derived objectively from this commissioned placed-based evaluation, but would require further discussion, refinement and implementation planning to inform possible next steps.

Table 11: Evidence-based recommendations to streamline delivery of BP@home in NCL

Technology & Digital	1.	**Audit, appraise & review** the performance of current tools that facilitate asynchronous communication between HCPs and patients to promote engagement, follow-up, tracking activity & monitoring impact.
	2.	The **NCL template should be simplified** by only using the 2 main SNOMED codes (tracking of BPMs and tracking of patient's readings).
	3.	**Maintain simple & easy to use asynchronous communication modality (e.g., Florey)** until a better option becomes available and support the request of HCPs for an unlimited validity of links to provide readings.
	4.	**Pilot using Suvera should be objectively evaluated by a third party** in Southwest PCN to inform evidence-basic commissioning decisions before possible scale out to other PCNs in NCL.

Person-centeredness	5.	Consider **'branding' the SMS** that patients receive with NCL or PCN logo / graphics.
	6.	**Promote person-centred care & approaches where possible**, so that messaging & engagement is adapted to each patient (whilst maintaining non-digital options for patients with limited digital access/literacy).
	7.	**Identify & install SPoC at Practice/PCN level to 'lead' on patient engagement at the coal face of primary care for BP@home.** This approach could help tailor support based around patients' perspectives, experiences & needs, especially those from underserved communities.
	8.	**Nominate [a] competent HCP(s) to be "the face(s)" of BP@home in NCL.**
	9.	Consider **updating SMS to enhance motivational component** in a bid to increase traction with patients.
	10.	**Include links to helpful resources in SMS** so that patients could refer to it even after the Florey expires.
Logistical		Co-produce placed-based mechanisms to streamline delivery of **BPMs on prescription.**
	11.	**Engage pharmacists** in devising logistics & liaising with patients.
Project Management & Operational	12.	**Promote centralised project management** at all levels (ICS, PCN, practice).
	13.	**Promote enhanced task-sharing** between specialty leads focused on LTCs.
	14.	**Embed BP@home into BAU** through supported training & capacity building.
	15.	**Deploy 'reverse-thinking' at practice level** (i.e., plan logistics prior to entering BP@home) and support practice-specific processes.
	16.	**Continue to embed quality improvement culture** and provide specific & adequate training to HCPs and use funding & clinical targets (e.g., QoF) as incentives.

Generalisability of findings from NCL deep dive evaluation

These findings are in line with existing literature which suggests that the barriers limiting the efficient and widespread implementation of remote self-monitoring among doctors and patients are cultural, structural, and financial (5, 6, 7). Regarding HCPs, studies show that these barriers include the lack of adequate infrastructures and secure means of data transmission which may prevent doctors from receiving patients' data and from interacting with them. There are also important costs relative to the implementation and maintenance of the IT tools as well as training of HCPs (6). HCPs interviewed in Scotland also expressed concerns about the additional workload and the responsibility to act immediately when faced with a continuous stream of readings (7). It has been recommended that IT tools and systems should be more user friendly, cost effective, durable and with better safety standards (5).

While this research focused on HCP experiences and perspectives, respondents also commented on patients' potential barriers and drivers. These findings are also congruent with existing literature on the topic, which highlights the frequent inadequacy of remote monitoring programs to the needs of specific demographic groups (5) as well as the challenge posed by socio-economic inequalities to equal access, use and adoption of eHealth services (8). Routine monitoring of BP, the @home programme in general and the growing movement of self-qualification will also support the emergence of the Self-Driven Healthcare movement tin the UK (9).

Summary & conclusion

The findings of this evaluation demonstrate the potential of digital tools to support and streamline the successful implementation and use of BP@home in primary care. However, several challenges and requirements were identified, including the need for robust IT systems and internal processes, the need for PCN/ICS-wide templates coupled to the need for clear guidance and training for HCPs.

On balance, we recommend that NCL continues to deliver BP@home using the current standard IT offer that facilitates asynchronous engagement with patients (i.e., AccurX). Embedding a quality improvement approach to identify mechanisms to continually improve how the service is delivered is crucial. NCL leadership may also consider the evaluation findings of alternative tools currently being trialled locally (e.g., pilot using Suvera across one PCN) to drive evidence-based commissioning decision making as the BP@home initiative becomes even more embedded in routine general practice.

Further research and quality improvement initiatives are needed to help streamline how BP@home is delivered in the real-world setting, coupled to research that seeks to investigate patients' experience and perspective as users and beneficiaries of the program.

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