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The development of Future Health Today: piloting a new platform for identification and management of chronic disease in general practice

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ABSTRACT

Chronic disease identification and management is a significant issue in Australia, with general practice being the primary contact point for those at risk of, or living with, chronic disease. However, there is a well-described gap between guideline recommendations for chronic disease management and translation in the general practice setting. In 2018, a group of researchers, clinicians and software developers collaborated to develop a tool to support the identification and management of chronic disease in general practice, with the aim to create a platform that met the needs of general practice. The co-design process drew together core principles and expectations for the establishment of a technological platform, called Future Health Today (FHT), which would sit alongside the electronic medical record (EMR) management system within general practice. FHT used algorithms applied to EMR data to identify patients with, or at risk of, chronic disease and requiring review. Using chronic kidney disease as a clinical focus, the FHT prototype was piloted in a large, metropolitan general practice, and a large regional general practice. Based on user feedback, the prototype was further developed and improved. This paper provides a report on the key features and functionalities that participants identified and implemented in practice.

Keywords: chronic disease, chronic disease management, chronic kidney disease, co-design, general practice, health informatics, innovation, primary care.

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Chronic disease management in primary care

More than 11 million Australians are estimated to have at least one chronic disease, such as type 2 diabetes, chronic kidney disease (CKD) or heart disease (AIHW 2020*a*). Most people who are at risk of or have a chronic disease will receive at least some health care in general practice. Successful chronic disease management has been linked to the use of 'Chronic Care Models' (Coleman *et al.* 2009). Key elements of 'Chronic Care Models' include decision support and clinical information systems, often facilitated through technology. The challenge is to develop and implement health technologies that avoid the pitfalls of the past, such as the failure to adopt, scale up and/or sustain use (Greenhalgh 2018), retrofitted non-purpose built solutions and minimal use due to resource-intensive implementation (Culler *et al.* 2013; Pefanis *et al.* 2018).

Research design and the team

'Co-design' is a research strategy and design process (Dimopoulos-Bick *et al.* 2019) that includes end-users and stakeholders, making the acceptance and adoption of technology more likely (Altman *et al.* 2018). In the initial co-design, we used tools such as patient journey maps, storyboards, service prototypes and conducted 'Think Aloud' interviews

with end-users to develop the minimum viable product (described elsewhere, Hunter *et al.* 2020). This paper describes the subsequent co-design process undertaken to test and refine the prototype by gathering end-user, stakeholder and expert feedback. Our prototype focused on CKD, a condition that is both common and under-diagnosed. Nearly 2 million Australians are estimated to have biomedical markers of CKD; and many of those with the condition are not aware of their diagnosis (AIHW 2020*b*).

The research team for this project included disease specialists, academic and clinical general practitioners (GPs), academic lawyers, non-clinician primary care researchers, health informaticians and information technology experts.

Ethics approval

Ethics approval was granted by the Melbourne Health Human Research Ethics Committee (HREC/47394/MH-2018). The research was undertaken with appropriate informed consent of participants.

The intervention

FHT is an audit and feedback intervention, comprising a software platform that encompasses a web-based 'dashboard' and a 'point-of-care' (POC) clinical prompt to facilitate the management of chronic disease in general practice. The dashboard organises patient populations according to their kidney health status using sophisticated algorithms. This population can then be recalled to the general practice for medical review. The dashboard contains links to education, guidelines and consumer resources, and can also be used to facilitate quality improvement (QI) programs. The program can 'drill down' into information within the electronic medical record (EMR) database to display, in graphical format, a patient's anthropometric measures (i.e. height, weight and body mass index (BMI)), summaries of medications, pathology results, medical conditions and Medicare Benefit Schedule items billed. The POC tool deploys when a patient's EMR is opened, facilitating opportunistic chronic disease identification and management through the prompts for clinicians to consider specific clinical actions, and links directly to the platform that provides the GP with the patient-specific data (as described above) and evidence-based guidelines. Fig. 1 provides a visualisation of how FHT interacts with the practice EMR. A data governance document for the program was developed and made publicly available on our website and is available in Supplementary File S1.

The first stage of implementation involved installing FHT server-side components (CKD algorithms, web application programming interface (API), and database). Participants were provided with a link and login to the FHT-dashboard and the POC was installed on individual computers. Evaluation was undertaken during the implementation process where key components of the technology, elements that were desirable (but not yet incorporated), and factors impacting implementation within the clinical setting were explored.

Participants

FHT was first piloted at a large metropolitan general practice in the western suburbs of Melbourne (Site A), who use

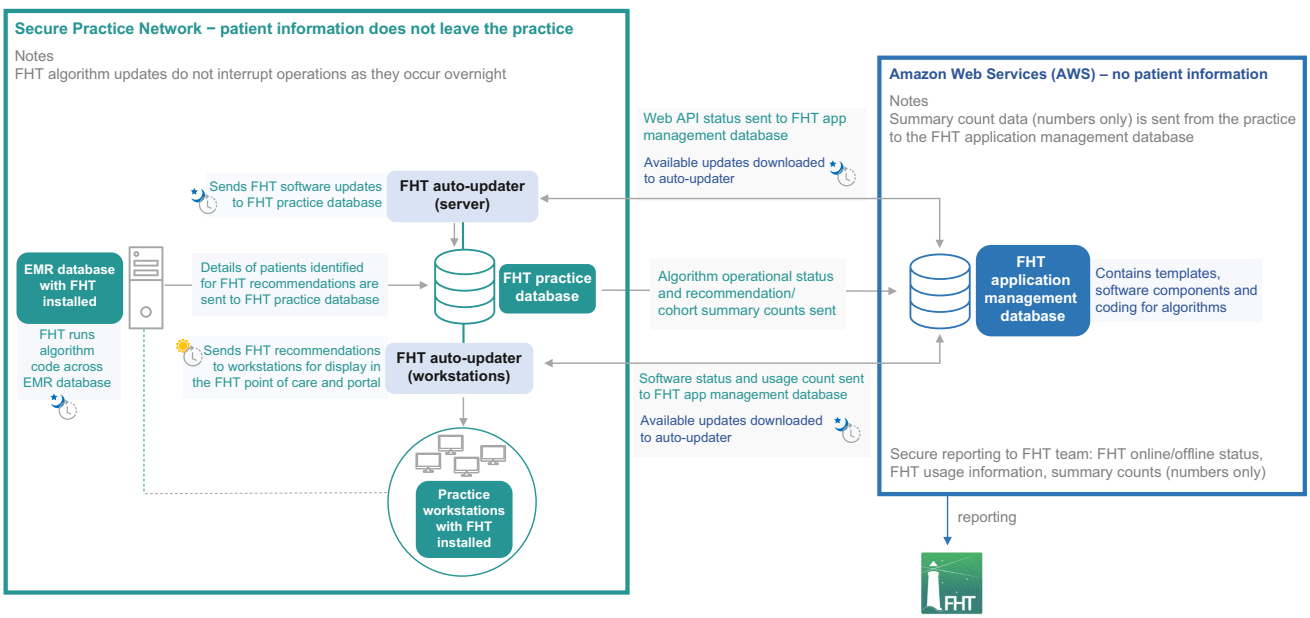

Fig. 1. FHT data flow.

Zedmed EMR (Zedmed). One GP and one practice nurse (PN) at that site had contributed to the co-design of FHT. Six staff (three GPs, one PN, one chronic disease health assistant (CDHA), one practice manager (PM)) agreed to test and implement FHT. The CDHA is a non-clinical role, responsible for facilitating and managing large-scale patient recall for chronic disease management and assisting with care planning.

After the initial pilot activity at Site A, FHT was introduced to a large regional general practice in northern Victoria (Site B) who use Best Practice EMR (Best Practice Software Pty Ltd), where the PM and one PN tested the initial installation and implementation of FHT.

Data collection

Data collection took place at Site A in July–October 2019 and included:

- Ten development/troubleshooting interviews (30–60 min duration) were conducted over 4 weeks with pilot testers (two GPs, PN, CDHA) using the FHT dashboard and/or POC, focusing on functionality and issues associated with use (e.g. system or algorithm problems, user errors).
- Five implementation interviews were conducted with FHT users (one GP, PN, CDHA) over 6 weeks, focusing on how FHT was used, changes required and the impact of FHT on clinical practice.
- A single focus group (60 min) at the end of the implementation period (three Researchers, three GPs, PN, CDHA, PM) was conducted where barriers and facilitators to implementation, health professionals' engagement with FHT, attributed improvements and recommendations to improve the program were examined.
- Eight interviews were conducted with patients who had been identified by the FHT algorithms, where their perceptions of the use of FHT in general practice were explored.

An additional two informal interviews were conducted with the PM and PN at Site B in late 2019 to determine if the technology was working and broadly acceptable to them.

Issues raised during interviews were discussed with the implementation and technical team to facilitate timely resolution. Researchers also asked participants to document any troubleshooting queries and to provide this to the research or technical team.

Analysis

Interview transcripts and field notes were analysed using content and thematic techniques. Analyses applied deductive and inductive coding schema, encompassing a provisional list of codes including components of the theoretical framework underpinning the project (Clinician Performance Feedback Intervention Theory; CP-FIT; Brown *et al.* 2019) and implementation research outcomes (acceptability, adoption, appropriateness, feasibility, implementation cost), supplemented by codes generated from the data.

What was learnt from the initiative?

The PMs at both sites were strong proponents for its implementation, enabling staff time to test the FHT prototype over the 6 months of implementation. Site A facilitated implementation through the CDHA and PN who coordinated chronic disease management and were familiar with using clinical audit tools for filtering and recall processes. They used the FHT platform and supported GPs in using the POC component of FHT. In contrast, the PM and PN at Site B primarily used FHT in a light touch, minimal-use manner over a shorter time period (4 weeks). At both sites, participants attempted to use FHT as part of their usual workflow and were hoping to streamline processes and facilitate clinical care using FHT.

Initial troubleshooting

The first 'real-world' test of FHT at Site A was designed to explore if FHT could function as intended, and to iteratively improve the platform as issues or improvements were identified. Participants were encouraged to report significant issues as they occurred and to record minor issues/improvements for further discussion. Issues were logged with the technical team, prioritised and progressively reviewed until resolved during this 'troubleshooting phase' (Table 1).

We revised algorithms and functions to reflect technical requirements, clinical guidelines and pragmatic decisions adopted by the clinical team. For example, Australian guidelines recommend a statin for patients with CKD aged >50 years (Kidney Health Australia 2020); however, we revised the clinical prompt recommendations to also reflect US preventive guidelines that did not recommend statin use in people aged >75 years without a history of CVD (Hager *et al.* 2017). This revision was made in response to clinician feedback and in consultation with nephrology colleagues. Other issues required revision of algorithms to allow for specific issues related to the EMR database to be addressed (e.g. information not displayed/captured as expected).

At the end of the first month of testing, participants reported that the system was working well and that many 'teething' issues had been resolved. However, time saved using the system was instead used to check accuracy as participants did not yet 'trust the information it was giving' (PN1). In looking for errors, they discovered more issues related to their EMR rather than the FHT platform,

Table 1. Resolution of issues raised during implementation.

Issue number	Location	Description	Quote	Resolution
Data management				
1	EMR	Results not being read by FHT causing FHT recommendation to be incorrect	So, it's been irritating, it's getting less irritating (GP1, Female, Site A)	Result read directly from Pathology practice and not from within EMR software; Onsite validation checking
2	EMR	Documents (e.g. letters from specialists not able to be read by FHT)	–	Not solvable if letter scanned in PDF format Requires additional data input onsite or change to modes of communication and use readable format. All EMRs impacted by this. Investigate technological solutions
3	EMR	CKD not coded in a recognisable format (e.g. renal impairment)	There you go, back three years look . . . so no coding whatsoever . . . No codes in my (notes) – there was coding, . . . but I wasn't applying it at the time of the consultation. (GP1, Female, Site A)	Broaden definitions to be captured by FHT. Undertake extensive mapping of coding used in EMR Educate practitioners to improve coding to CKD 1-5 and use of correct fields for data entry. Consider FHT module that supports data quality improvements
Protocols for recall of patient cohorts				
4	Dashboard	Process for follow through of cohort recall process	–	Refinement of functionality to reflect workflow. Evaluate in different practices
5	Dashboard	Cohort group numbers and quality improvement impacted by number of providers engaged with FHT	(a) Yeah, we're all nerds, we all nerded out at the start. (PN1, Female, Site A)	Participants were encouraged to 'play' with a dummy dataset. Early adopters circulated 10 top tips for CKD management
			(b) 'we struggle with it'. (PN2, Female, Site B) – introducing new tech 'quicker to do it the way you know' (even if it isn't quicker; CDHA, Female, Site A)	Design of FHT revised to improve user interface – less technical, more intuitive
Appearance, feel and functionality				
6	Point of care	Size, colour and pop-up function caused parts of the EMR to be covered or participants to feel irritated by it	It feels like a patch, literally, it feels like something that's a patch. (GP1, Female, Site A)	Change the way the POC appears on screen. POC able to be moved around screen
7	Point of care	Design of POC and functionality	(a) It reminded me to think about her kidneys because there's a box lit up . . . it's a really good visual reminder of what to do. (GP2, Male, Site A)	Redesign of 'POC' to make it less obtrusive (navy to turquoise blue). Size reduced and 'minimised' where there were no CKD-recommendations
			(b) I think, when I explained it and I understood it better. It's as simple as that really isn't it? If you're looking at cholesterols . . . up until now . . . I'd have been . . . shall I start a cholesterol-lowering medication on you? You know, is there any evidence?.. So, now I go, okay, I understand we've got this kind of grey zone and up to 75 we're doing one way, but I still think . . . if they're a good 79-year old . . . they might live another two decades or something. So you think, in those terms, well, we've got to start thinking like we used to think of 60-year olds. (GP1, Female, Site A)	
8	Point of care	Limited time to discuss CKD opportunistically during consultation	(a) So, if that's being automated and you can say, okay, this piece of software's telling me that you've got this problem, and while we might not have time to deal with that today, let's flag it now. It's just so good from that point of view. It's just very stressful. General practice is very	Consider time-management during education around introducing FHT into individual practices. Pilot site received extensive researcher input during early phase. Revise training program and materials to support scalable implementation

(*Continued on next page*)

Table 1. (*Continued*).

Issue number	Location	Description	Quote	Resolution
			stressful and so, anything that can reduce my stress is good. (GP3, Female, Site A)	
			(b) I think it has great potential, it does work for me and the point of care as well, when I get time to look at it. We're talking about agendas though, patient agenda, versus doctors agenda, doesn't always align ... sometimes you switch off, it's like anything, if it's there all the time, sometimes you actually don't read it (because) it's just not aligning with what the patient wants to talk about at the time and so ... I'm not going to start talking about it. (GP3, Female, Site A)	Appearance was refined over time to accommodate preferred functions and simplify processes
GP knowledge and self-efficacy				
9	–		I bit the bullet and actually diagnosed (a particular patient) as chronic kidney disease... I said, 'Oh your kidneys, I think we actually need to plan, your kidneys are starting to be affected.' And she said, 'oh so I should take my blood pressure medicine every day', I said, 'Yes you should'. We talked about why it was important and she said ' I will really do it now, yeah.' (the patient had stage 3, eGFR in the 40s) ... And we were managing it, I just hadn't called it that. And it just gave me the confidence to tell her, 'You really do need to'. (GP1, Female, Site A)	Future implementation to provide educational support framework

prompting several internal actions, including an EMR software-update to correctly extract pathology data; corrections to CKD-coding and archiving of inactive patients (Table 1, Quotes 1, 3).

Fit with workflow

Site A actively worked to embed FHT into clinical workflow, using the FHT prompts to initiate kidney health checks, review medications and instigate referrals.

The PN and CDHA used the dashboard to generate patient recall lists. The PN identified two categories of patients (diagnosed CKD requires initiation/intensification of statin or blood pressure medications) and generated a list of names (n = 46), which was checked using patient files to determine the accuracy and appropriateness for recall. The patient's usual GP was asked to review and authorise recall if appropriate. From this process, 17 patients were recalled (Alexander *et al*. 2019). The PN reported that although the FHT recall function worked, they were unsure about what 'would happen next' if they marked a patient as 'recalled' and were unsure how to indicate in the EMR the action taken. A 'recall-authorisation' feature was inserted into FHT because of PN (and co-design) feedback. The PN and CDHA also noted that the search and filter functionality of the dashboard could be difficult for users less familiar with existing audit software. Site B participants, self-described as 'less technically savvy' reported difficulties in understanding and using these functions. These statements align with feedback from participants in the 'think-aloud' co-design sessions and suggest that the user interface required work.

After extensive use, Site A participants flagged items that they would like to see added to future iterations of FHT, including the ability to label and save lists of patients. Navigation of FHT depended upon participants' familiarity with similar features in other databases (including clinical audit software, spreadsheets like Excel and other data management software), with three participants confidently using filtering and sort functions (CDHA, PN and one GP) whereas one GP required support to use this feature.

Experience facilitates use

GPs were more likely to use the POC tool prior to consultation to review patient information. This tool sits permanently at the bottom corner of the computer screen and updates as new patient records are opened in the EMR. Although participants initially expressed annoyance at its presence, over time, it became less intrusive as the technological team reduced the size of the POC-icon and automatically minimised it when FHT did not have any recommendations.

GPs reported using POC frequently, not switching it off, and addressing the recommendations provided by FHT directly, or after further interrogation of patient data.

They also found it easy to move between the POC and the patient record, and reported opportunistic interventions with patients as FHT became part of routine practice (Table 1, Quotes 8a, 8b).

Accuracy

Irrespective of the content of the alert, GPs were checking patient records to confirm that the recommendation (or lack of recommendation) was correct. In some instances, the GP used their knowledge of the patient to initiate a kidney health check even when FHT indicated that no action was required. For these participants, the presence of the POC, rather than the detail contained within it, prompted them to reconsider patient risk factors and preventative health strategies (Table 1, Quote 7a).

Actionability

GPs sometimes experienced patient resistance to FHT recommendations, especially where medications needed to be enhanced. However, one GP described how the FHT recommendation both validated her decision to initiate a statin with a reluctant patient, and increased her confidence explaining it (Table 1, Quote 7b). Nevertheless, for FHT recommendations to be discussed, they needed to align with the patient's agenda, and they may require more consultation time (Table 1, Quotes 8a, 8b). This was also foreseen in the co-design session.

Links to guidelines

Participants supported the inclusion of resources and guidelines, accessible from both the FHT dashboard and POC, but reported not revisiting them following implementation, despite occasionally wanting to refresh their knowledge (e.g. initiating a statin). Participants had no explanation for this, aside from 'forgetting' that resources were available.

Clinical knowledge

Self-reported awareness of kidney health increased among participants, following CKD and FHT education and training sessions, direct use of FHT and the recall process. As knowledge increased, participants' confidence with diagnosis and management of CKD also increased (Table 1, Quote 9).

Patient perspective

Patient feedback is reported elsewhere (Alexander *et al.* 2019); however, all eight patient interview participants reported no concerns with GPs using a program like FHT as they saw it to be an extension of the systems GPs currently use, and in many instances, preferred that their GPs were using relevant available technology.

Improvements in implementation

The installation of FHT at Site B was more streamlined and quicker than the initial installation at Site A, despite using a different EMR infrastructure. This was the result of many refinements of the tool, growing sophistication of the platform and experience in installation of the FHT team.

Participants at Site B reported that the system was not disruptive to their usual systems; however, they found the user interface of the dashboard to be inaccessible due to its

Table 2. Post-project refinements of Future Health Today (FHT).

Component of FHT	Changes made in further piloting
Point of care (POC)	Formatting changes, including change of colour order (more white space), increased use of icons and links made obviously actionable
	Additional menu items added to facilitate user being able to mark the recommendation as actioned or to message the FHT team to query why the recommendation was made for a particular patient
	Hover function to display reasons for recommendation
	Link from POC to dashboard
	Enhanced resources available on POC with links to relevant guidelines, links to resources for communicating with patients, and resources explaining the recommendations to clinicians
	POC automatically expands to facilitate visibility of multiple recommendations
Dashboard	Enhanced resources available on dashboard with links to relevant guidelines, links to resources for communicating with patients, and resources explaining the recommendations to clinicians
	'How-to' training videos for all components of FHT added
	Addition of 'news/features' box on the homepage
	Further refinement of how lists of patients are identified and managed
Installation technology	The installation and updates of the FHT platform were standardised and automated to provide a consistent installation approach across all practices and EMR platforms

technical look and feel, mirroring comments made from Site A.

Significant improvements were made to the platform after the implementation period, including a new 'landing page' where users could create, view and manage a list of patients through recall and management processes and record QI activities. This was intended to increase the accessibility of the platform and avoid the need to export patient lists to obtain recall permissions from individual GPs. QI resources were added and FHT information and support was strengthened. The POC pop-up was revised to only emerge (and turn orange) when a recommendation was active and to auto-minimise (and turn green) when not required. Exemplar screenshots of the components of the FHT platform and POC are available in Supplementary File S2.

FHT was further refined during a larger pilot comprising 12 practices in 2020–21 (see Table 2 for summary of refinements) and was expanded to include recommendations relating to type 2 diabetes, cardiovascular disease and identification of cancer risk. The revised version has been implemented in a randomised controlled trial involving 41 practices (due to conclude in late 2022).

Conclusion

This evaluation demonstrated that implementation of co-designed technology into general practice that involves continued iterative development is acceptable to participants. Although participants desired the sophisticated functionality of the platform, they preferred the interface to look unobtrusive, be easy to use, and fit within general practice context and workflow. The prototype required several workarounds to align with clinical practice, but over time, significant improvements were made to the platform: QI resources were added, and FHT information and support was strengthened. Further research is underway to evaluate ongoing use of FHT, and additional modules are currently being developed as a result of additional grant funding being obtained. Options for sustainability of the program beyond the initial funding period are being explored.

Supplementary material

Supplementary material is available online.

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Data availability. Qualitative data used to generate the results in the paper are not available, given the small sample of participants.

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