

Barriers and Enablers to Implementation of mHealth Programmes

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Abstract—Despite developing several successful mHealth interventions, researchers have struggled with implementation in practice. Key stakeholders in New Zealand were interviewed for their perspectives on barriers and enablers. Their feedback was mapped to the Consolidated Framework for Implementation Research (CFIR), and, from there, to the Expert Recommendations for Implementing Change (ERIC) framework. In this way, twenty recommended implementation strategies were identified. Some of these may be beyond the ability of researchers to influence, however, many can be employed during the development and research phases and may increase the likelihood of translation into real world implementation.

Keywords—mHealth; implementation.

I. INTRODUCTION

mHealth describes health interventions and health information that is provided to people using their mobile phones. Although the mHealth field is progressing at a rapid pace, there continues to be a lack of significant large-scale implementations.

There have been various studies regarding the success or failure of implementing mHealth innovations in practice. Often, barriers to implementation concern the structural and cultural aspects of the system rather than the intervention or technology itself [1]. In fact, a WHO study from 2011 found that competing priorities in an overworked health system were the main barrier to implementing mHealth, followed by a lack of knowledge about its applications, a need for policy that recognises mHealth as a legitimate approach for addressing health, and cost-effectiveness [2]. Other studies of barriers have included usability of the intervention, integration of the tool into existing systems, data security and privacy, resistance to change, and a lack of planning, funding, capacity, training, and support [3]–[6].

We set out to examine the perspectives of key stakeholders in New Zealand to the enablers and barriers impacting mHealth implementation. Our group (the National Institute for Health Innovation (NIHI) at the University of Auckland) has developed many mHealth programmes. Some were successful in large randomised controlled trials [7]–[11], or pilots [12][13], and some were not proven effective in the research phase [14][15]. One was developed as an ongoing service rather than out of a research project [16]. To date, only one programme has successfully moved from

proven research evidence to implementation [7][8], being run for many years as a national smoking cessation service and stimulating many other such cessation services internationally [17]. Considering other successful programmes languishing between publication and implementation, we wished to learn if there was more that we could do to prepare our planned future research developments for eventual implementation. Therefore, the purpose of this study was to obtain input from decision makers in the health sector to inform our current and future mHealth research programmes for greater translation into practice.

This paper describes our original research with Section II outlining the methods used, Section III describing the key findings from interviews and the results of our mapping to constructs and implementation strategies, and in Section IV we discuss how we could use these strategies and our next steps.

II. METHODS

Key senior stakeholders in New Zealand were interviewed as part of several ongoing mobile health development and implementation projects being conducted by NIHI at the University of Auckland. These ten stakeholders covered the spectrum from the Ministry of Health to local funding organisations, primary health care organisations, a University, and an academic/industry/health service research partnership. Their roles included funding, contracting, health service improvement, clinical leadership, research and innovation. Stakeholders were identified by the lead mHealth researcher (RW) as key people familiar with the implementation of previous, existing or planned NIHI mHealth programmes. These programmes focus on various health topics such as smoking cessation, diabetes self-management support, cardiac rehabilitation and pulmonary rehabilitation. Potential interviewees were asked to participate by the lead mHealth researcher. All those approached consented and were interviewed.

Interviewees were asked about their role in mHealth implementation and both barriers and enablers that they have faced in the past or would anticipate for future projects. Semi-structured interview guidelines were developed by the entire team. All interviews were conducted by an independent student (LF) during an international internship at NIHI. The interviewer also conducted all

analyses independently of the researchers at NIH. Interview notes were summarised and main ideas were identified and mapped.

As this study was focused on enablers and barriers, the Consolidated Framework for Implementation Research (CFIR), developed by Damschroder et al. [18], was chosen as a means to frame interview responses and recommendations. This model provides a comprehensive structure for identifying what has/has not worked in the past and what might work/not work in future mHealth projects. It brings together the various existing implementation theories and key constructs. The goal of the CFIR is to look at the context of an intervention and assess possible barriers and enablers to its implementation. CFIR consists of five domains, and a total of 39 specific constructs within these:

- *The intervention domain* comprises the flexibility, complexity, adaptability, and other characteristics of the intervention itself.
- *The inner setting* involves organisational elements such as culture, structure, leadership, and readiness for change.
- *The outer setting* involves the economic, social, and political context of the organisation. The outer setting also includes patient needs.
- *The individual level* looks at choice and behaviour of those involved in the implementation and is driven by their personalities, mind-sets, and so on.
- *The process level* examines the actual change process surrounding the intervention—this includes engagement, planning, executing, and reflecting/evaluating.

The Expert Recommendations for Implementing Change (ERIC) framework developed by Powell et al. [19] proposes 73 different implementation strategies that can be used in isolation or conjunction. These have been categorised under nine domain headings by Waltz et al. [20]:

- Use evaluative and iterative strategies
- Provide interactive assistance
- Adapt and tailor to context
- Develop stakeholder interrelationships
- Train and educate stakeholders
- Support clinicians
- Engage consumers
- Utilise financial strategies
- Change infrastructure

These strategies were then mapped to the CFIR (framed as barriers to implementation) based on respondents choosing the most appropriate ones for each construct [18]. A matching tool is available at [21].

III. RESULTS

All of the interviewees were enthusiastic about the potential for mHealth to positively impact health outcomes. However, interviewees indicated that despite evidence of positive health outcomes, there is a lack of funds and other resources in the system to implement and maintain the use of these tools. There was a general tone of frustration around inertia and a feeling that tools that are shown to be effective in supporting and improving patient wellbeing cannot get implemented.

Overall the tone was pessimistic, with a general feeling that systemic changes were needed to successfully implement mHealth and that these changes were a long way off. While technology advances, the challenges of its implementation remain constant.

The most popular responses were:

- Tools/interventions are often viewed as additive, rather than substitutive, and therefore compete with other demands and priorities
- There is difficulty working across health service organisations (eg. primary and secondary care) to implement interventions - in terms of competing priorities, disconnect in data and information, many different stakeholders, and varying structures
- It is incredibly important to manage relationships between clinical and management staff and ensure clinical engagement with the intervention
- The innovation and its impact should be aligned with wider organisational (and national) strategies, goals, and priorities—however, this can be difficult as priorities change
- It is difficult to integrate a new technology into current processes where old legacy systems exist and there is a lack of interoperability across units, departments, hospitals, and organisations
- There is a general culture of risk aversion that is resistant to change
- Using intensive on-site training, ongoing support, and multi-disciplinary teams to plan and implement the tool is helpful
- Having consumer champions in addition to clinical champions is important
- Funding needs to be committed and secured early so that work can continue after a successful pilot finishes – agree outcomes to be demonstrated to release funds

Key points brought up by interviewees were categorised as either enablers or barriers and mapped to the specific CFIR constructs (Table I). This shows that planning, engaging, networks and communications, and external policies and incentives were the most commonly cited CFIR constructs.

TABLE I. KEY BARRIERS AND ENABLERS

CFIR Domain	Main Ideas from Interviews (Barrier (B) or Enabler (E))	No. (n=9)	Specific CFIR Construct
Intervention Characteristics	Easily integrated into existing systems and work processes (E)	2	Adaptability
	Generic interventions more likely than disease-specific to get funding (B/E)	1	Relative Advantage
	Convenient and functional for clinicians (E)	1	Complexity
	Robust process for approving apps, based on clinical and privacy issues (E)	1	Evidence Strength and Quality
	Design with end-user in mind (E)	1	Evidence Strength and Quality
	Private PHOs are able to get things done if commercial value can be demonstrated (E)	1	Relative Advantage
	Strong evidence demonstrated over reasonable length of time (E)	2	Evidence Strength and Quality
	Individual Level	Tools/interventions often viewed as additive rather than substitutive. Competing demands (B)	3
Culture of fear/risk-aversion (B)		3	Other Personal Attributes
GPs operate in commercial environment and may not value public health projects (B)		2	Knowledge and beliefs about the intervention
Find early adopters for the intervention (E)		2	Individual Stage of Change
Inner Setting	Alignment with organisational strategy/goals/priorities (E)	3	Compatibility
	Securing executive leadership and multiple sign-offs (B)	1	Leadership engagement
	Difficulty working across DHBs and PHOs (B)	6	Networks and Communication
	Disconnect of data and information sharing across organisations and primary/acute care (B)	1	Networks and Communication
	Culture of fear/risk-aversion (B)	3	Culture, Implementation Climate
	Old legacy systems, lack of interoperability (B)	3	Compatibility
	Lack of time and resources dedicated to operationalising tools (B)	1	Available Resources
	Broad promotion and board engagement (E)	1	Networks and Communication Leadership Engagement
	Incentivise use of tool for patients and staff (E)	1	Organisational Incentives and Rewards
	Managing clinical relationships and clinical engagement (B)	4	Networks and Communication
	Board priorities can change quickly (B)	2	Relative Priority
	No place in Allied Health/nursing budget for technology (B)	1	Available Resources
	Outer Setting	Different patient engagement than with traditional care system (B)	1
Politics and relationships get involved when choosing projects to fund (B)		1	Networks and Communication
No framework to help prioritisation process (B)		1	External Policies and incentives
No framework for measuring and evaluating innovations (like what exists for medicines) (B)		1	External Policies and incentives
Issues with patient data—security/privacy (B)		1	External Policies and incentives

	Patients with multiple comorbidities may need a suite of tools (B)	1	Patient needs and resources
	Competition exists amongst big DHBs (B)	1	Peer Pressure
	National priorities can change quickly (B)	1	External Policies and incentives
	Poor health literacy and non-compliance of patients (B)	1	Patient needs and resources
	Fit mHealth into accreditation, ongoing education, training, medical council guidance, etc. (E)	2	External Policies and incentives
Process	Poor management of control and adoption phases, translating to implementation (B)	2	Executing
	Use of MDTs (E)	3	Engaging
	Both clinical and consumer champions (E)	3	Champions
	Design for implementation from the start (E)	1	Planning
	Difficult to scale projects from local to national level (B)	3	Executing
	No framework to help prioritisation process (B)	1	Planning
	No framework for measuring and evaluating innovations (like what exists for medicines) (B)	1	Reflecting and Evaluating
	Find early adopters for the intervention (E)	2	Opinion Leaders, Champions
	Use MBIE sourcing rules early in process to create plan post-pilot (E)	1	Planning
	Secure funding for continuation of intervention after pilot finishes (E)	3	Planning
	Change the timing of funding—agree outcomes before that must be demonstrated to release funds; payments contingent on milestone reporting (E)	3	Planning
	Using expanded health teams—not just GPs—to deliver intervention (E)	2	Engaging
	Intensive on-site training and support available (E)	1	Executing
	Secure early buy in, socialise people to the idea early on (E)	2	Engaging
	Need to see pathway to commercialisation from beginning (E)	1	Planning
	Using expanded health teams—not just GPs—to deliver intervention (E)	2	Engaging
	Need a group to enable the bureaucratic process (E)	2	Formally appointed implementation leaders

Using the mapping tool provided by the CFIR website [21], the most relevant ERIC strategies for these CFIR constructs were:

1. Identify and prepare champions
2. Assess for readiness and identify barriers and facilitators
3. Conduct local consensus discussions—to discuss whether the chosen problem is important and the tool is appropriate
4. Inform local opinion leaders—about the innovation, so that they can influence others
5. Build a coalition—recruit and cultivate relationships with partners in effort to implement
6. Capture and share local knowledge—from implementation sites on how others made it work
7. Conduct educational meetings—targeted at different stakeholder groups to teach about the innovation
8. Alter incentive/allowance structures—to Incentivise adoption and implementation

9. Conduct local needs assessment—regarding the need for the innovation
10. Create a learning collaborative—groups of providers to learn and improve implementation
11. Facilitation
12. Identify early adopters
13. Promote adaptability—tailor to meet local needs
14. Develop a formal implementation blueprint—to include all goals and strategies, scope of change, timeframe, milestones, and progress measures
15. Tailor strategies—in order to address barriers and leverage facilitators
16. Organise clinician implementation team meetings—protected time to reflect, learn, and support each other during implementation
17. Involve executive boards
18. Recruit, designate, and train for leadership—for the change effort
19. Use advisory boards and workgroups
20. Conduct cyclical small tests of change

IV. CONCLUSION

Our key stakeholders believe in the potential for mhealth to have positive impacts on helping our patients, however, they feel these programmes are unlikely to be implemented due to lack of funds and other resources to implement and maintain the use of these tools. Our findings are not dissimilar to those previously identified - lack of policy or national standards around the provision of mHealth, a need for compatibility with current work systems and processes, and insufficient resources and funding [22].

We mapped identified enablers and barriers to implementation framework constructs and, from there, to recommended implementation strategies. These fall into three groups. First are those strategies that are outside our control, such as altering incentive structures to promote adoption and implementation, and organising clinician implementation team meetings. Developing a formal implementation blueprint is something that we could perhaps conduct with a willing implementing organization, but in our experience is unlikely to be supported until there is actually approved funding for an implementation.

Second is the group of strategies that NIHI already uses in the development and research phases of our mHealth programmes [23]. From the start we try to involve clinical champions, advisory boards and workgroups, and build a coalition of relevant local organisations. In this way we build on local knowledge and networks and tailor for local needs. We work with the target audience in focus groups, surveys and other formative research methods to determine their needs, whether an mHealth initiative could be helpful, and their preferred tools. Recruitment methods are tailored according to how we think the programme will be implemented locally.

The third group of identified strategies included areas that NIHI could focus more on in our current and future mHealth developments. Our existing methods tend to focus on particular levels in the system – that is, the consumers/end users, clinicians, champions and local services – but not at the executive board or funder level. We could spend more time engaging at this higher level, assessing readiness and identifying barriers and facilitators upfront. This could have a greater focus on the longer term implementation strategy to fit with national and regional priorities and programmes, and therefore increase the likelihood of committing funding.

This may also align with the He Pikinga Waiora Implementation Framework developed in New Zealand that has indigenous self-determination at its core [24]. Under four over-arching elements (cultural centredness, community engagement, systems thinking and integrated knowledge translation) seven components can be scored as high/medium/low/negative in order to assess the likely effectiveness of proposed interventions. One of these components includes the degree to which different levels of change (macro, meso and micro) are taken into account, with rationale and context for each level.

The next step will be to deliberately consider the identified strategies and how they apply at each of these levels, in the early stages of our mHealth programme development in New Zealand, and to evaluate whether these strategies have an impact on implementation.

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REFERENCES

- [1] E. H. Shortliffe, “Strategic action in health information technology: Why the obvious has taken so long,” *Health Affairs*, vol. 24(5), pp. 1222-1233, 2005.
- [2] WHO Global Observatory for eHealth, *mHealth: new horizons for health through mobile technologies: second global survey on eHealth*. Geneva: World Health Organization. <http://www.who.int/iris/handle/10665/44607>, 2011.
- [3] V. P. Gurupur and T. Wan, “Challenges in implementing mHealth interventions: a technical perspective,” *mHealth*, vol. 3, pp. 32, 2017.
- [4] V. M. Kiberu, M. Mars, and R. E. Scott, R, “Barriers and opportunities to implementation of sustainable e-Health programmes in Uganda: A literature review,” *African journal of primary health care & family medicine*, vol. 9(1), pp. e1-e10, 2017.
- [5] D. J. Meyers et al., “Management challenges in mHealth: failures of a mobile community health worker surveillance programme in rural Nepal,” *BMJ Innovations*, vol. 3, pp. 19-25, 2017.
- [6] L. Wallis et al., “A roadmap for the implementation of mHealth innovations for image-based diagnostic support in clinical and public-health settings: a focus on front-line health workers and health-system organizations,” *Global Health Action*, vol. 10 (sup3), 1340254, 2017.
- [7] A. Rodgers et al., “Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone

- text messaging,” *Tobacco Control*, vol. 14(4), pp. 255-61, Aug. 1, 2005.
- [8] D. Bramley et al., “Smoking cessation using mobile phone text messaging is as effective in Maori as non-Maori,” *New Zealand Medical Journal*, vol. 118, pp. 1216, 2005.
- [9] C. Free et al., A randomised controlled trial of mobile (cell) phone text messaging smoking cessation support: txt2stop. *Lancet* 2011; 378(9785), pp. 49-55.
- [10] R. Maddison et al., A Mobile Phone Intervention Increases Physical Activity in People with Cardiovascular Disease: Results from the HEART Randomised Controlled Trial. *European Journal of Preventive Cardiology*, 2014.
- [11] R. Dobson, R. Whittaker, L. Pfaeffli Dale, and R. Maddison, The effectiveness of text message-based self-management interventions for poorly-controlled diabetes: A systematic review. *Digital Health* 2017, 3, pp. 1-12.
- [12] L. Pfaeffli-Dale et al., Text message and Internet support for coronary heart disease self-management: results from the Text4Heart randomised controlled trial. *JMIR* 2015; 17 (10).
- [13] C. Ni Mhurchu et al., Feasibility, acceptability and potential efficacy of a mobile health (mHealth) weight management programme for ethnically diverse adults. *BMC Obesity* 2014, 1:10.
- [14] R. Whittaker et al., STUB IT: randomized controlled trial of a theory-based video messaging mobile phone smoking cessation intervention. *J Med Internet Res* 2011: 13(1); e10.
- [15] R. Whittaker et al., MEMO: an mHealth intervention to prevent the onset of depression in adolescents. A double blind randomised placebo-controlled trial. *J Child Psychol & Psychol* June 2, 2017.
- [16] R. Dobson et al., Development of a culturally tailored text message maternal health program (TextMATCH). *JMIR mHealth & uHealth* 2017;5(4):e49.
- [17] WHO Be Healthy Be Mobile global initiative <https://www.who.int/ncds/prevention/be-healthy-be-mobile/en/>
- [18] L. J. Damschroder et al., Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 4(50), 2009.
- [19] B. J. Powell et al., A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implementation Science.* 10(1), 2015.
- [20] T. J. Waltz et al., Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the Expert Recommendations for Implementing Change (ERIC) study. *Implementation Science.* 10(1), 2015.
- [21] CFIR Research Team. The Consolidated Framework for Implementation Research. Retrieved from <https://cfirguide.org/>, 2018.
- [22] J. Ross, F. Stevenson, R. Lau, and E. Murray, Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update). *Implementation Science.* 11 (1), 2016, pp. 146- 153.
- [23] R. Whittaker, S. Merry, E. Dorey, and R. Maddison, A development and evaluation process for mHealth interventions: examples from New Zealand. *Journal of Health Communication* 2012, 17, sup.1, pp. 11–21.
- [24] J. Oetzel et al., He Pikinga Waiora Implementation Framework: A tool for chronic disease intervention effectiveness in Māori and other indigenous communities. *International Journal of Integrated Care.* 2018 Mar 12;18(s1).