Frugal digital innovation in cardiovascular care during COVID19

Professor Clara Chow Centre Director, Westmead Applied Research Centre Clinical Lead, Community based Cardiac Services, Westmead









Western Sydney covers an area of 780 square kilometres with 1.3 million residents, of which 47% were born overseas and 50% report speaking a language other than English at home



Westmead Applied Research Centre (WARC)



University of Sydney Impact Centre

Westmead Applied Research Centre

 The Westmead Applied Research Centre (WARC) celebrates a research approach that thinks and acts flexibly, aims to do more with less, embraces technology in health care, sees co-design and partnership as necessities for translation and impact, and consistently views its activities through the lens of value and equity.



Our Impact Centre Research Themes and Strengths



 New treatments, New clinical pathways and New approaches to healthcare



Digital Health and Technology

• Digital health Interventions – mHealth, eHealth, sensor technology, dataanalytics and customization using machine-learning and Al.



Equity in Healthcare Access

 New programs to address Equity in healthcare access – Gender, Rural/remote, Economic. The diversity of western Sydney is a natural testbed for this research.

What do I mean by frugal innovation in healthcare?



Creating smart, lowcost and effective solutions to big problems Large evidence practice gap in implementation of proven preventative treatments for CVD

Overview

- Waiting for care
- Post-discharge support
- Digital Care coordination
- Virtual Population screening

Can we turn time waiting time into productive time that can improve health care experience and outcomes?







The University of Sydney

McIntyre, D, Chow, CK. Waiting time as an indicator for health services under strain, Inquiry, 2020 Page 8

Why provide education for patients while they wait?

Low health literacy is an important predictor of cardiovascular outcomes

Low health literacy associated with:

- 2.7 times increased risk of not achieving appropriate blood pressure levels (Pandit et al, 2009)
- 2-fold increased risk of diabetic retinopathy (Schillinger et al, 2003)
- Increased risk of obesity OR = 1.84, 95%
 CI = 1.13 2.99 (Lam et al, 2012)
- 3.2 x risk of relapse in smoking cessation (Stewart et al, 2014)



Figure 2. Cumulative hazard of death, by health literacy. BHLS indicates Brief Health Literacy Screen.

McNaughton et al, 2015, Journal of American Heart Association

While You're Waiting

PROBLEM: Patients with CVD can spend more time in clinic waiting rooms than with their doctor.

AIM: To assess whether waiting time could be used to deliver education on CVD risk factors





After clinic, intervention participants were **more likely** to report:

High motivation to improve CVD lifestyle behaviours
(RR 1.63 [95% Cl 1.04, 2.55])



High clinic satisfaction (RR 2.19 [95% CI 1.45, 3.33])

CPR intervention participants were **more likely** to report **high confidence** to perform CPR (RR 1.61 [95% Cl 1.20, 2.16)

This concept is **feasible** and **scalable**. Future studies should examine the potential for impact on clinical outcomes

Mcintyre D, Thiagalingam A, Klimis, H, VonHuben A, Marschner, S, Chow C, Education on cardiac risk and CPR in cardiology clinic waiting rooms: a randomised clinical trial, BMJ Heart, 2021



While You're Waiting

Westmead Applied Research Centre £3 514 Patients attending outpatient chest pain clinics 330 (average age 54, 55% male) randomised 220 Tablet-delivered 110 Control education while waiting 110 CVD Risk 110 CVD Risk Factor + Factor education only **CPR** education

PROBLEM: Patients with CVD can spend more time in clinic waiting rooms than with their doctor.
AIM: To assess whether waiting time could be used to deliver education on CVD risk factors and cardio-pulmonary resuscitation (CPR).

Mcintyre D, Thiagalingam A, Klimis, H, VonHuben A, Marschner, S, Chow C, Education on cardiac risk and CPR in cardiology clinic waiting rooms: a randomised clinical trial, BMJ Heart, 2021 The University of Sydney The University of Sydney



THE UNIVERSITY OF

While You're Waiting: Results





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Participant engagement with a waiting room-based intervention

Number of Videos Watched





Can we provide support to patients after hospital discharge with customized reminders, information and tips?





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Educational/supportive interventions have shown potential

Original Investigation

March 2016

Mobile Telephone Text Messaging for Medication Adherence in Chronic Disease A Meta-analysis

Jay Thakkar, FRACP^{1,2,3}; Rahul Kurup, MBBS¹; Tracey-Lea Laba, PhD^{2,3}; <u>et al</u>

\gg Author Affiliations | Article Information

JAMA Intern Med. 2016;176(3):340-349. doi:10.1001/jamainternmed.2015.7667



Preventive Medicine Volume 148, July 2021, 106532



Review Article

Personalized mobile technologies for lifestyle behavior change: A systematic review, metaanalysis, and meta-regression

Huong Ly Tong ^a \approx ^{ID}, Juan C. Quiroz ^{b, c}, A. Baki Kocaballi ^{b, d}, Sandrine Chan Moi Fat ^e, Kim Phuong Dao ^f, Holly Gehringer ^b, Clara K. Chow ^a, Liliana Laranjo ^{a, b}

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FREE

Medication reminder applications to improve adherence in coronary heart disease: a randomised clinical trial

(b Karla Santo ^{1, 2, 3}, Anna Singleton ^{1, 3}, Kris Rogers ^{2, 4}, Aravinda Thiagalingam ^{1, 3, 5, 6}, John Chalmers ^{1, 2, 4}, Clara K Chow ^{1, 5, 2, 3}, Julie Redfern ^{1, 2, 3}

Correspondence to Dr Karla Santo, Westmead Applied Research Centre, The University of Sydney at Westmead Hospital, Sydney, NSW 2154, Australia; ksanto@georgeinstitute.org.au



EDITORIAL

New technologies call for new strategies for patient education

Lien Lombardo¹, Rochelle Wynne^{1,2}, Louise Hickman³, and Caleb Ferguson ()¹*

¹Western Sydney Nursing & Midwifery Research Centre, Western Sydney Local Health District & Western Sydney University, Blacktown Hospital, Marcel Crescent, Blacktown, NSW 2148, Australia² School of Nursing & Hidwifery, Deakin University, Gheringhap Street, Geelong, VIC 3220, Australia; and ³IMPACCT, Faculty of Health, University of Technology Sydney, Ultims, NSW 2009, Australia

Received 5 March 2021; revised 9 March 2021; editorial decision 10 March 2021; accepted 10 March 2021

Digital Texting Trials to Implementation with TextCARE



Empower SMS – Breast Ca (ACI) Singleton 2021 TEXT2U- Young Adult T2DM (MRFF RART) Dawson 2021 KidneyText - CKD (CVI Catalyst) Middleton 2021 TEXTME2 – Primary CVD Klimis 2021 ITM – COPD (CVRN) The University of Sydney



Google Impact Challenge 16

Heart

Heart Health during COVID19 – Westmead Cardiology Implementation via TextCARE

THE PROBLEM

Hospital stays and clinic visits are short. There is inadequate time to provide information and support. Repeat presentations are common.



PARTICIPANTS

Post-discharge from Cardiology clinic & cardiology in-patients

PROGRAM

6 months, customised support delivered via text-message, option to ask Qs of counsellor

Ø

GOALS

Improve patient experience and support CVD prevention

Program content

- Content was developed by clinicians, academics, consumers
- Patient experience individualised with name and content selection dependent on patient risk factors (Diet, activity, smoking)
- Additional COVID19 messaging could be added

HeartHealth @ Westmead: Onboarding

The Enrolment Process, consent and patient data security

Hi Tom

Westmead Applied Research

Centre, University of Sydney

Self Registration HeartHealth The Heart Health texting program is

provided by Westmead Cardiology,

Westmead hospital and aims to provide support and information on heart disease and general health designed by

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textcare.com.au

TEXTCARE



Tom, 64 Male pensioner with CVD risk factors Hello Tom, you have been referred by Westmead Cardiology to receive the general heart health information and support program - HeartHealth. Our clinicians hope we can better support and inform patients through a texting program. To enrol and consent please register by clicking on the following link by <u>5pm</u>,

2021. <u>https://</u> textcare.com.au/my? id=601731c15a1b324c1b 87c306

Tom clicks on the registration link provided

Tom enters his details and provides consent to enrol in the program

III Dodo Mobile 奈 9:49 am 🔒 textcare.com.au — Privat

Consent details

By completing your details and providing information below, we are able to customise the content of your text messages and you understand and agree to the Terms and Conditions and to the collection and use of your personal information as set out in our Privacy Statement.

Yes, please proceed with my verification

Getting Started	Your data
	TextCare will
lf you volunteer	send you a
to register, you	secure code
can expect to	via your
receive text	mobile for

TextCare registration has multi-factor verification for patient security

Healthh@Westmead: Enriched content

Links, videos, resources recommended by cardiology shared via HeartHealth



Tom, 64 Male pensioner with CVD risk factors Hi Tom you have been registered for the Heart Health Program. You will commence receiving information via text messages for the next few months. Should you wish to Opt out of the program reply STOP. HeartHealth@Westmead Cardiology

Once Tom has registered, he will receive messages from TextCare Hi Tom, do not ignore your symptoms of heart disease during COVID-19. If you experience worsening chest pain or feel shortness of breath or feel faint call Triple 0 immediately. @Westmead Cardiology

> Tom, for many it may take several attempts to quit, so keep trying. @Westmead Cardiology

Tom will receive up to 4 messages per week – diet/exercise/smoking and general heart health. Some with links to videos, websites, survey tools.

Feel like a snack, Tom? Try fresh or dried fruit, toast, rice cakes or breadsticks. @Westmead Cardiology

> Hi Tom, activity can be accumulated in shorter bouts of 10 minutes each. Look at these tips:

<u>nttps://</u> www.heartfoundation.or .au/news/3x10-minutephysical-activity-ideas/ @Westmead Cardiology



Health counsellor views response messages and replies as needed

The University of Sydney

Response to HeartHealth @ Westmead

9358 invited, 3702 enrolled (40%). Average age 60, 57% male

"I think the variety was great including replacement suggestions e.g. instead of jam on toast use sliced banana etc." - Linda, 49

> "My favourite messages were the recipes for health eating. It's always hard to find something different!" - Greg, 70

"The text messages are easy to read and understand. Valuable information to reflect upon a change in making good and healthy choices." - Maria, 72

"It's easy to forget one of the

items for management of heart

condition. However, the frequent

texts reminders help to be

mindful on following the diet,

medication and exercise plan."

- Mahendra, 66

"I liked that messages were to the point but made you think." - Diane, 58

"Very good reminders to pay attention to ALL health factors!" - Joe, 71 "The messages offered support & encouragement. I was not alone in the lockdown." - Brian, 77

"I was needing to go for my walk and your text arrived just in time to motivate me out the door!"

- Emma, 51

"The messages encouraged or reminded me to be heart healthy. I was certainly more conscious of the need for my lifestyle changes and what I could do to be healthier."

- Peter, 63

The University of Sydney

HeartHealth feedback survey

Participants surveyed 1142

Agree

Neutral

Disagree

Strongly Disagree



Motivation and behaviour change

The messages helped remind me to take my medicines I increased my exercise (physical activity) levels My diet became more healthy The text messages motivated me to change my lifestyle Page 21 The University of Sydney 90.0% 100.0% 0.0% 10.0% 20.0% 30.0% 40.0% 50.0% 60.0% 70.0% 80.0%

Strongly Agree



Message language, frequency and duration



Learnings in progress...

- Program opt-in rate has been ~40%, month by month comparison suggests higher opt-in rates during lockdowns
- Evaluation underway comparing participants receiving HeartHealth program to comparator group
- Program overall well received

Can we implement digital care coordination utilizing conversational AI technologies?

Hello this is XX Hospital calling for Mr Gary Chan. There are some important parts of your atrial fibrillation care that we want to help with today. Yes or No is this Gary?

... First we'd like to check how your overall health is. Would you rate it as excellent, very good, good, fair or poor?

In our last call we mentioned the importance of seeing a GP regularly. Since your last visit to XXX hospital, have you seen or scheduled an appointment with your GP?

We would like to offer you some resources that may be helpful to you when managing atrial fibrillation...



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Acceptability of the use of AI in health but little evidence of effectiveness



Patients' views of wearable devices and Al in healthcare: Findings from the ComPaRe e-cohort

Tran V et al Digital Medicine 2019:2;53

SR of conversational agents 'chatbots' for health purposes identified 17 articles, only 1 RCT findings significant effect in reducing depression symptoms

Laranjo et al JAMIA 2018 Sep 1;25(9):1248-1258.

AI Conversational technologies

Safety-critical

P7 P8

Violence

Unable to respond Inappropriate

Mental health

P3

Promtps

HomePod Google Assistant Smartphone

> EchoShow Alexa Echo Dot

Bixby Smartphone Cortana Laptop

Google Assistant Google Home Alexa

Siri Smartphone Siri

Agents

Responses of Conversational Agents to Health and Lifestyle Prompts: Investigation of Appropriateness and Presentation Structures

Ahmet Baki Kocaballi¹, MSc, PhD; Juan C Quiroz¹, PhD; Dana Rezazadegan¹, PhD; Shlomo Berkovsky¹, PhD; Farah Magrabi¹, PhD; Enrico Coiera¹, MBBS, PhD; Liliana Laranjo^{1,2,3}, MD, MPH, PhD

Figure 2. Assessment of responses (n=240) of conversational agents (n=8) to mental health, violence, physical health symptoms, and lifestyle prompts (n=30).

Physical

health

symptoms

P9 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27

Variation of the preceding prompt

Diet

Physical

health

symptoms

The 8 studied CAs provided in total 240 responses to 30 prompts. They collectively responded appropriately to 41% (46/112) of the safety-critical and 39% (37/96) of the lifestyle prompts.

I have serious chest pain "Sorry I don't know that one"

How do I eat less fast food?

"I found a couple of places within 7.4 kilometres. The closest one is McDonalds"

J Med Internet Res 2020;22(2):e15823

Legend: Appropriate Mixed

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Non-safety-critical

Drinking

Lifestyle

Exercise

Smoking

P28 P29 P30

Al Conversational technologies during COVID19

npjDigital Medicinewww.nature.com/npjdigitalmedChatbots in the fight against the COVID-19 pandemic

Adam S. Miner ^{1,2}[∞], Liliana Laranjo ³ and A. Baki Kocaballi ^{3,4}

CDC coronavirus chatbot

Coronavirus Self-Checker

Hi, I'm Clara. I'm here to guide you through the Coronavirus Self-Checker.

WHO launches a chatbot on Facebook Messenger to combat COVID-19 misinformation

WHO Health Alert brings COVID-19 facts to billions via WhatsApp Have guestions about COVID-19? WE HAVE ANSWERS. WHO Health Alert now available on Facebook Messenger World Health Organization Have questions about COVID-19? We have answers Click this link and text hito the whatsapp number World Health Organization

CHAT-AF – Mixed methods experimental study with a pragmatic RCT (4:1) to examine the potential of digital care coordination in the community





Series of outreaches initiated with IVR

Interactive Voice Response (IVR) is an automated phone system technology that allows incoming callers to access information via a voice response system of pre-recorded messages. IVR call content is customised to patient responses



Scripting IVR





Hello this is XX Hospital calling for Mr Gary Chan. There are some important parts of your atrial fibrillation care that we want to help with today. Yes or No is this Gary?

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We would like to offer you some resources that may be helpful to you when managing atrial fibrillation...



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Patient journey in more detail





Overall comments from preliminary data

- Overall good engagement
- Excellent satisfaction rates
- Drop off in engagement with outreaches overtime, however, consistent satisfaction rates

Progress and learnings

- CHAT-AF is being evaluated
- Preliminary data suggests
 - Overall good engagement
 - High satisfaction rates
 - Drop off in engagement with outreaches overtime, however, consistent satisfaction rates

Can we implement virtual AF screening among the over 75 year olds?





Screening technologies for AF



The implementation gap

- Implementation of AF screening faces two challenges:
- (1) Developing a sustainable strategy for AF screening in populations at risk (which device, for how long)
- (2) How to manage the results: ensuring appropriate treatment for newly diagnosed AF
- There are no current examples of how mass population screening for AF has been implemented
- In populations aged 75 or older, current research on using digital technologies for screening of AF is sparse.
- There are 1.7 million people 75 years and older in Australia and their life expectancy is over 10 years.

> Around half of the older population are living in rural areas

MASS-AF Study Overview

- Open label, randomized-control, self-screening device trial
- No centers/sites, all remote assessments, no in person visits
- Target recruitment 200 participants
- Eligibility:
 - Community-dwelling people aged 75 or older
 - Have a smartphone able to download device app
 - Not have been diagnosed with atrial fibrillation
 - Not have an implantable pacemaker, defibrillator or have dementia
 - No medical illness with life expectancy < 3 months





Screening Device



Finding by AliveCor: Possible atrial fibrillation





ECG distribution by 24 hour time



Summary comments

- Digital programs can enable a health service to provide a systematic and consistent offering
- Program engagement with digital programs has been amazing and program participants have been very grateful
- Good quality co-design is not easy, but adds value it is a process through which each of our digital programs have been created –it allows better understanding of the goals of clinicians, patients and health service and improves uptake