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Complete List of Authors:	Cheung, N Wah; University of Sydney, Redfern, Julie; University of Sydney, Westmead Clinical School Thiagalingam, Aravinda; University of Sydney, Sydney, Australia, Sydney Medical School, ; Westmead Hospital, 3. Cardiology Department Hng, Tien-Ming; Blacktown Mount Druitt Hospital, Diabetes & Endocrinology Shariful Islam, Sheikh Mohammed; The George Institute for Global Health Haider, Rabbia; University of Sydney, Diabetes & Endocrinology Faruquie, Sonia; Westmead Hospital, Diabetes & Endocrinology Chow, Clara; University of Sydney, Westmead Applied Research Centre
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Text messaging support for patients with diabetes or coronary artery disease (SupportMe): Protocol for a pragmatic randomised controlled trial

N Wah Cheung[1,2,3]
Email: wah.cheung@sydney.edu.au

Julie Redfern[2,3]
Email: julie.redfern@sydney.edu.au

Aravinda Thiagalingam[1,2,3]
Email: aravinda.thiagalingam@sydney.edu.au

Tien-Ming Hng[4]
Email: tien-ming.Hng@health.nsw.gov.au

Sheikh Mohammed Shariful Islam[2]
Email: SIslam@georgeinstitute.org.au

Rabbia Haider[1,3]
Email: Rabbia.Haider@health.nsw.gov.au

Sonia Faruquie[1,3]
Email: Sonia.Faruquie@health.nsw.gov.au

Clara K Chow[1,2,3]
Email: clara.chow@sydney.edu.au

On behalf of the SupportMe investigators

[1]Westmead Hospital, Sydney, Australia

[2] The George Institute for Global Health, Sydney, Australia

[3] University of Sydney, Faculty of Medicine and Health, Westmead Applied Research Centre, Westmead Clinical School

[4]Blacktown Hospital, Sydney, Australia

Corresponding Author
N Wah Cheung
Dept of Diabetes & Endocrinology
Westmead Hospital
Westmead NSW 2145
Australia
Email: wah.cheung@sydney.edu.au
Telephone: 612 88906796

The SupportMe Investigators
David Burgess, Bridie Carr, N Wah Cheung, Jin Gun Cho, Clara K Chow, Michael Crampton, Sonia Faruquie, Cate Ferry, Rabbia Haider, Alison Hayes, Tien-Ming Hng, Sheikh Mohammed Shariful Islam, Stephen Leeder, Simon Raadsma, Julie Redfern, Chris Rissel, Aravinda Thiagalingam

ABSTRACT

Introduction

Low-cost interventions providing self-management support are needed for people with coronary artery disease (CAD) and diabetes. Mobile phone text messaging provides a potential vehicle for this. The SupportMe Trial aims to assess the feasibility of embedding a text-messaging program into routine clinical practice, and will determine if this improves cardiovascular risk factor and diabetes control amongst patients with CAD or type 2 diabetes.

Methods and Analysis

SupportMe is a randomised controlled trial to be conducted within the framework of a health district-wide integrated care program for people with CAD or T2DM. One thousand subjects will be recruited, with at least 500 in each group. Intervention subjects will receive 4 text messages a week for 6 months which provide advice, motivation, information and support for disease management and healthy behaviour. The primary outcome is the change in systolic blood pressure. Secondary outcomes include body mass index, waist circumference, low-density lipoprotein cholesterol, physical activity levels, dietary intake, quality of life, mood and smoking cessation, and for subjects with diabetes, glycosylated haemoglobin and fasting serum glucose. A process and economic evaluation will also be conducted.

Ethics and Dissemination

The study has been approved by the Western Sydney Local Health District Human Research Ethics Committee (AU RED HREC/16/WMEAD/331). Results will be disseminated via the scientific forums including peer-reviewed publications and presentations at national and international conferences.

Clinical Trials Registration

ACTRN12616001689460.

Trial Commencement and Completion

Commencement: March 2017

Anticipated completion: June 2019

Current protocol V4.0, December 2017.

Keywords

Randomised controlled trial, type 2 diabetes, coronary artery disease, text messaging

Word Count

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ARTICLE SUMMARY

Strengths and Limitations of this Study

- This trial investigates the feasibility of incorporating a text-messaging intervention into routine clinical care across an entire health district.
- This study tests the effectiveness of a single text-messaging program which can be customised for people with more than one chronic disease.
- This trial will be the largest study examining the effectiveness of text messaging support for people with type 2 diabetes.
- The text messages will be provided in English only.
- The study outcomes relate mainly to cardiovascular risk and diabetes control, and not hard clinical outcomes such as major cardiovascular events.

INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of death globally, accounting for 40 million, or 70% of the total deaths globally in 2015, rising by 14% since 2005[1]. Cardiovascular disease (CVD) accounts for almost half of the NCD deaths. Diabetes caused 4% of the NCD deaths, but its impact is growing rapidly, up by 32% since 2005[1]. The International Diabetes Federation estimated the prevalence of diabetes worldwide was 8.3% in 2014, and projected to increase to 9.9% by 2030, to affect more than 500 million people[2].

The major modifiable determinants of CVD are tobacco smoking, and the related risk factors of physical inactivity, unhealthy diet, hypertension, hypercholesterolaemia, and diabetes[3]. The incidence of CVD can be reduced by treatments and strategies which address these risk factors[3,4]. Early glucose and blood pressure control amongst people with type 2 diabetes may reduce mortality and diabetes complications[5,6]. Despite substantial evidence of clinical benefits, existing interventions are under-utilized and poor adherence to exercise, diet and smoking cessation are problematic[7].

Information and communication technologies have great potential for the delivery of preventative and educational healthcare programs at a large scale and at low cost[8]. A systematic review reported that such technology used in the detection and follow up of CVD provided better clinical outcomes, mortality reduction and lower health services utilization[9]. Systematic reviews have also found that text-message interventions almost double the likelihood of short-term smoking cessation[10] and medication adherence[11], and have provided some evidence of modest effects on weight loss[12], hypertension[13] and physical activity[14]. Previous trials of text messaging for people with diabetes have generally been small but show promise for the improvement of glycaemic parameters[13,15-17]. However apart from smoking cessation, these programs have not been widely implemented or translated into routine healthcare for patients. Moreover, previous trials have generally focused on single diseases or conditions.

The Tobacco, Exercise and Diet Messages (TEXT ME) study of 710 patients with coronary heart disease (CHD) was the first randomised controlled trial which demonstrated that a text messaging program providing motivation, support and education improved multiple clinical risk factor measures including LDL-cholesterol, blood pressure, body mass index (BMI), physical activity and smoking cessation[18]. As part of our long-term goal of developing a text messaging program for people with different or multiple chronic diseases, we have now adapted the TEXT ME intervention to undertake a text messaging support program for people with 2 different chronic diseases, namely type 2 diabetes or coronary artery disease (CAD), or both. The intervention will provide education, clinical management support and healthy lifestyle motivation, with the aim of improving cardiovascular risk factors and diabetes care.

Widespread delivery of text-message based education and support programs requires the intervention to be embedded into routine clinical care for people with chronic disease. This paper describes the protocol for the SupportMe randomised controlled trial. A major goal of SupportMe was to identify and address key questions in the implementation of text-message based education and support program into our existing health systems. Our test bed was the Western Sydney Local Health District (WSLHD) which serves a population of ~970,000 in Western Sydney, Australia.

METHODS AND ANALYSIS

Study Design, Setting and Population

SupportMe is a pragmatic randomised clinical trial of 1000 patients with CAD and/or type 2 diabetes (Fig 1). The study will be conducted in the ethnically and culturally diverse WSLHD but will also accept subjects from other health districts. Participants will be recruited via referrals from the community and hospital setting. We will leverage the framework of the Western Sydney Integrated Care Program (WSICP)[19] which involves over 200 general practitioners and 50 hospital clinicians to encourage referral to the SupportMe program.

The WSICP seeks to improve health outcomes for patients with chronic disease and improve the continuity of care across hospital and primary care services across the health district.

The program will be advertised to hospital clinicians via internal hospital communication pathways and to the general practitioners (GPs) through the Western Sydney Primary Health Network (which supports GPs). We will provide a variety of referral options including traditional letter-based referrals, fax, phone, email, SMS as well as e-referral through an internet portal.

To be eligible, subjects need to be 18 years or older, with i) CAD, defined as history of prior myocardial infarction or documented >50% of major coronary artery on invasive or non-invasive coronary angiography, and/or ii) type 2 diabetes, with an HbA1c in the last 6 months of 7.1%-11.4% (54-101 mmol/mol). Subjects need to own a mobile phone and be able to read text messages in English. We will allocate each referred patient with a screening ID number and maintain a "screening log" of referred subjects, which records basic demographic data, as well as the referral source. We will also record reasons for ineligibility and non-participation. Research assistants will assess the eligibility of subjects referred to SupportMe, explain the details of the study, and obtain consent from those who wish to proceed into the study. For subjects who enter the SupportMe trial, we will keep an "enrolment log" and we will notify their referring clinician and their GP (if this was not the referrer).

Randomisation

Randomisation will be in a uniform allocation of 1:1, with a block size of 8, stratified by health condition (CHD, Diabetes or CHD and Diabetes), and performed through an electronic platform. Personnel collecting baseline data will be blinded to treatment allocation. The computerised platform will connect with the text messaging platform to commence sending messages to the intervention subjects automatically based on randomisation. To minimise un-blinding at follow-up, participants will be sent a message reminding them not to reveal treatment allocation to follow-up data collectors.

The secure web-based Research Electronic Data Capture (REDCap) web application will be used for participant registration and data collection. Each subject who proceeded to the study will be assigned a unique study identification number in REDCap, and their name, initials, date of birth and contact details will not be recorded to ensure that the dataset is de-identified.

Intervention and Control

The SupportMe intervention is a simple patient-centred intervention designed to provide semi-personalised and customised support in clinical and lifestyle management, as an adjunct to standard care provided by the subjects' usual healthcare professionals. Participants allocated to intervention will receive four text messages per week that will be sent at random times between 9am and 5 pm during weekdays, over a 6 month period. These will be unidirectional, in that subjects will be sent messages but be advised that there is no expectation that they respond back nor is there a facility to interact with or discuss their specific health issues with the study team. However, a researcher will monitor messages sent from participants, and a record of these will be maintained. Where there are return messages which are a potential cause for clinical concern, the message will be escalated to a doctor for review. This researcher will not participate in any other data collection or individual level of analysis.

Control subjects will only receive a welcome message at the initiation of their participation in the trial, and a message at 6 months reminding them of their follow-up appointment. It is expected that both intervention and control participants will continue receiving usual care from their regular health professionals.

All participants will be offered brief training at enrolment on how to read a text message and how to delete or save messages. Participants may withdraw from the study at any time via a text message; in which case a team member will contact the participant regarding confirmation and the delivery of text messages to these subjects will be deactivated.

At the end of the 6 month program, maintenance messages will be sent to intervention subjects for a further 6 months at a frequency of 2 per week. Control subjects will be offered the opportunity to receive the SupportMe intervention at that point.

SupportMe Message Content

The text message content and program structure was developed according to our previously published process[20]. The text messages provide advice, motivation, information and support for disease management, monitoring of risk factors, and tips and links to engage in healthy behaviours. Each of the 4 messages the intervention subjects receive each week will focus on a different aspect of healthcare, namely (1) general health, (2) nutrition, (3) physical activity, (4) disease self-management. A different set of 4 message banks was developed for each of the 3 strata in the study; CAD, diabetes, and CAD with diabetes, though there are a number of messages common to the 3 strata. In addition, there are subsets of messages which enable a degree of customisation. These are smoker and non-smoker, insulin user and non-insulin user, vegetarian and non-vegetarian. Messages from each bank will be sent in a random order until 26 weeks has passed.

Existing validated messages which were used in the TEXT ME trial were reviewed for use in SupportMe. Additional SupportMe messages, mainly related to diabetes, were developed by a working group including endocrinologists, diabetes educators, dietitians, podiatrists, and clinicians in primary care, community health, population health, existing health promotion programs and consumers. The process followed was similar to that applied to the TEXT ME program[20,21], whereby the working group initially developed the text messages, then these were reviewed for readability and to ensure messages were presented with a positive focus. The text messages were modified based on feedback from the diabetes working group, and then underwent user testing with feedback and further modification. Examples of final text messages include: "*Did you exercise today?", "Has your Dr checked & discussed your cholesterol levels with you recently? These need regular review", "Healthy eating means at least 5 serves of vegetables & 2 serves of fruit every day", "If your sugars are regularly under*

4mmol/L or over 10mmol/L, it may be time to review your diabetes treatment - speak to your Doctor".

Our TEXT ME message management engine will deliver the messages for SupportMe. It selects messages from message banks as per prespecified algorithms using patient baseline data entered into the message management system. The engine sends messages through a telecommunications gateway to enable them to be sent to all participants on any Australian phone network at no cost to the participant and at a bulk-rate cost to the study.

Study Outcomes

The primary outcome of the study is change in systolic blood pressure after 6 months. This will be measured by a digital sphygmomanometer, three times in the sitting position, with the mean of the last 2 readings being recorded. Secondary outcomes include body mass index, waist circumference, fasting low-density lipoprotein cholesterol, physical activity (measured by the Global Physical Activity Questionnaire[22]), quality of life (measured by the 12 item short form (SF-12) health survey[23]), depression (measured by the Patient Health Questionnaire-9 depression scale[24]) and dietary intake (measured by the dietary component of the WHO STEPS instrument[25]), smoking cessation and medication use. Subjects with diabetes will also be evaluated for the additional secondary outcomes of HbA1c and fasting serum glucose. A composite outcome of guideline levels of risk factors achieved will also be analysed. Surveys and measurements will be conducted in face-to-face visits with research assistants who will be blinded to the subject's treatment allocation.

The protocol requires the closing study visit to be undertaken within one month of the 6 month time point. Study visits performed more than one month later will be regarded as protocol deviations, but nonetheless we will endeavour to capture the outcome data.

Process Measures

Process data will be collected from referral information, participant surveys, focus groups and analytical information. The screening log will collect information regarding the source of subjects referred to SupportMe, to enable an assessment of its integration into the WSICP and level of clinician engagement. The screening log will also provide data for reasons that

subjects were not enrolled into the SupportMe program. Analytical data extracted from the message software system will provide information about the time that messages are sent and the proportion of text messages successfully delivered (eg, if mobile phone mail boxes are full) will be recorded. A log will be kept of non-protocol participant contact with the study team, the reason for contact and the method used for contact (eg, by telephone, email).

SupportMe participants allocated to the intervention group will be administered a User Survey at the 6-month follow-up assessment. This questionnaire explores the acceptability of the text messages, identification of which messages participants remembered, liked or disliked, what they did with messages (eg, kept them or deleted them immediately), their perceived utility of the text messages and their opinion regarding the intrusiveness, timing, language and content suitability of the text messages. To obtain a more in-depth understanding of the potential barriers and facilitators for integration into existing health services and individual level to uptake of this program, we will also conduct purposive semi-structured interviews with a subsample of participants in the intervention group. Sampling will continue until thematic saturation occurs. We anticipate from previous experience the need to conduct approximately 20 patient interviews. Our research group have extensive experience conducting such evaluations alongside RCTs.

Economic Evaluation

We will conduct a cost-effectiveness and cost-utility analysis of SupportMe from a health sector perspective. The costs and health outcomes associated with the intervention will be compared in an incremental cost-effectiveness analysis. Direct health care costs will be determined by patient-level data linkage to the Medical Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS). The MBS and PBS are government funded schemes which provide subsidies for non-hospital attendances to healthcare providers (eg: general practitioners, specialists and some allied health providers such as dietitians), and for pharmaceutical agents respectively. Cost of hospitalisations will be determined from hospital admission records. We will use the SF-12 to determine Quality Adjusted Life Years (QALYs) in a trial based cost-utility analysis. Observed changes in clinical risk factors e.g. LDL-

cholesterol will inform longer term modelling of serious events and hospitalisations over a lifetime and thus estimate longer term costs, and cost-effectiveness of the intervention. For type 2 diabetes, patient-level risk factors will include measures of HbA1c which will be used in a validated health economic model. The per patient costs of intervention delivery will be used to estimate total costs of scaling up the SupportMe program at a state or national level.

Statistical analyses

We plan to recruit 1000 subjects into the study, with at least 500 patients with each of diabetes or CHD. Applying data from our earlier TEXT ME study[18], sample size estimates indicate that 707 subjects are required for 90% power to detect a difference of 2.5 mmHg in the primary outcome of systolic blood pressure between intervention and control groups. Within the strata of diabetes or CHD, a sample size of 500 would have >90% power to detect a 4 mmHg difference in SBP. Data from the Blood Pressure Lowering Treatment Trialist's Collaboration indicate that a reduction in BP of 5 mmHg reduces the risk of major cardiovascular events, irrespective of the form of pharmacotherapy[26]. We also planned for an adequate sample size to demonstrate an improvement in diabetes control, as measured by HbA1c. Applying local data regarding the distribution of HbA1c[27], a sample size of 562 is required for 80% power to detect a difference of 0.26% in HbA1c in the diabetes cohort. This quantum of HbA1c reduction translates to a 5% reduction in risk of diabetes complications[28]. As we expect at least 20% of CHD patients to also have diabetes, there will be at least 600 patients with diabetes in the total 1000 subject cohort.

The study will follow the intention-to-treat principle for analyses and participants will be analysed at 6 months by original assigned groups. Baseline comparisons between groups will be undertaken by independent t-tests or Mann-Whitney tests for continuous variables and chi square tests for categorical variables.

Our primary analyses will by analysis of covariance (ANCOVA) with baseline variables of analyses parameters uses as covariates where appropriate. Heterogeneity of treatment on the primary endpoint will be assessed in pre-defined subgroups of baseline values for BP,

BMI, LDL-cholesterol, HbA1c, and background BP lowering therapy, ethnicity, age, gender, participation in the WSICP, and medical conditions.

ETHICS, GOVERNANCE AND DISSEMINATION

The study has been approved by the Western Sydney Local Health District Human Research Ethics Committee. The study will adhere to the National Health and Medical Research Council ethical guidelines for human research. Written and informed consent will be obtained from all participants. The trial has been registered with the Australian New Zealand Clinical Trials Registry, ACTRN12616001689460. This includes all items from the World Health Organization Trial Registration Set.

The study will be administered by the George Institute and the University of Sydney, with the design and conduct overseen by a project management committee. This committee has expertise in large-scale clinical trials and qualitative research, economic analysis, clinical CVD and diabetes management and healthy policy implementation at both a local and national level. It includes investigators and partners in the program. The program will also report to the WSICP Steering Committee.

A data monitoring safety board comprising a clinician with expertise in diabetes, and a second with expertise in cardiology will evaluate all serious adverse events. A manual of procedures has been developed, outlining study procedures including definitions, study organisational structure, quality control, procedures for collection and recording of data, monitoring and audit of the study, procedures for patient withdrawal, non-compliance and protocol violations.

Only the chief investigators (NWC, JR, AT, TMH, CKC) and trial statistician will have access to the final de-identified dataset. The full protocols and de-identified dataset will be made available from the investigators on reasonable request, and subject to ethics approvals. The findings of this study will be disseminated via the usual scientific forums, including peer-reviewed publications and presentations at national and international conferences.

Authorship will be based on the International Committee of Journal Editors guidelines. We have followed the SPIRIT reporting guidelines[29].

CONCLUSION

SupportMe will develop new evidence as to whether a single text messaging support program will improve clinical parameters for people with different chronic diseases, namely cardiovascular disease and diabetes, and whether this can be successfully implemented into a wider chronic disease program. The project will also provide an economic analysis and understanding of cost as well as barriers and enablers associated with implementation and patient satisfaction.

Information technology and communication are considered key enablers of successful integrated care programs[30]. However, this has largely focused on the use of information systems and communication between healthcare providers, rather than between the healthcare program and the patient. The mobile phone is increasingly being recognised as a simple everyday technology which can be used to provide information and self-management support directly to patients. Simple texting programs administered by computerised message management systems make them affordable, scalable and practical to deliver as an adjunct to our existing health services. There are already data that text-messaging can effectively improve clinical outcomes or parameters by supporting people with chronic diseases and conditions such as CVD, asthma, smoking and medication adherence[18,31]. As earlier discussed the previous data for diabetes has been mixed, and based on small trials, but a recent large randomised controlled trial has shown that a comprehensive text-messaging based diabetes support program significantly reduced HbA1c[32].

The challenge now is to develop and test text messaging interventions which are adaptable to people with different or multiple chronic diseases, and to implement these as a part of routine care. Indeed, with the high prevalence of chronic diseases, large scale population health interventions are required. The low cost of text messaging systems without the need

for routine input from a health professional, makes them ideally suited for this purpose. In Australia, 50% of the population has at least one of eight chronic diseases, and half of these people have at least two such conditions[33]. Cardiovascular disease is the disease group responsible for the highest expenditure[33]. With a high prevalence of chronic disease, and many people having multiple diseases, it is impractical for a patient to enrol in a separate text messaging program for each of their chronic conditions, or for busy clinicians to manage the complexity of referring their patients to different text messaging programs. SupportMe tests the effectiveness of an intervention for people with either CVD or diabetes, or both disorders, and paves the way for a multifaceted text messaging support program to be developed. A single text messaging system, which includes multiple customised modules for people with other prevalent chronic diseases such as chronic obstructive pulmonary disease, chronic kidney disease, and mental health disorders, as well as any combination of these disorders would be highly desirable.

For these individuals, better preventative care and fostering of self-management will decrease the need for access to tertiary services and hospitalisation. Provision of text message programs at the point of hospital or community health engagement will enable the health service to support larger numbers of patients at a low-cost, enhance patient involvement with their care and their perception of the health service supporting them.

A limitation of our program is that messages will be delivered in English only, and in a multicultural society such as Australia, we need to overcome language barriers to healthcare. We intend to develop messages in other languages for future text-messaging programs we plan to undertake. However, this is not a process of simple translation, as the messages need to be culturally and linguistically appropriate for each individual language group, and undergo a rigorous process of testing[34].

In summary, by conducting SupportMe within the framework of the Western Sydney Integrated Care Program, and encouraging referrals from clinicians involved in the clinical services offered by the WSICP, we will be testing if a text messaging program can be successfully implemented as standard care for patients in a chronic disease integrated care program which runs across a large health district, and improve clinical outcomes. Ultimately,

for a mobile health initiative to be successful beyond the life of a clinical trial, it has to be a part of standard care. This requires support from fund-holders in health services, to support it as part of a larger program, rather than being a stand-alone intervention.

Author contributions

CKC, NWC, SMSI, JR, and AT conceived the original study concept. All authors contributed to the design of the study, protocol development, its implementation, and drafting of the manuscript.

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Competing Interests

None

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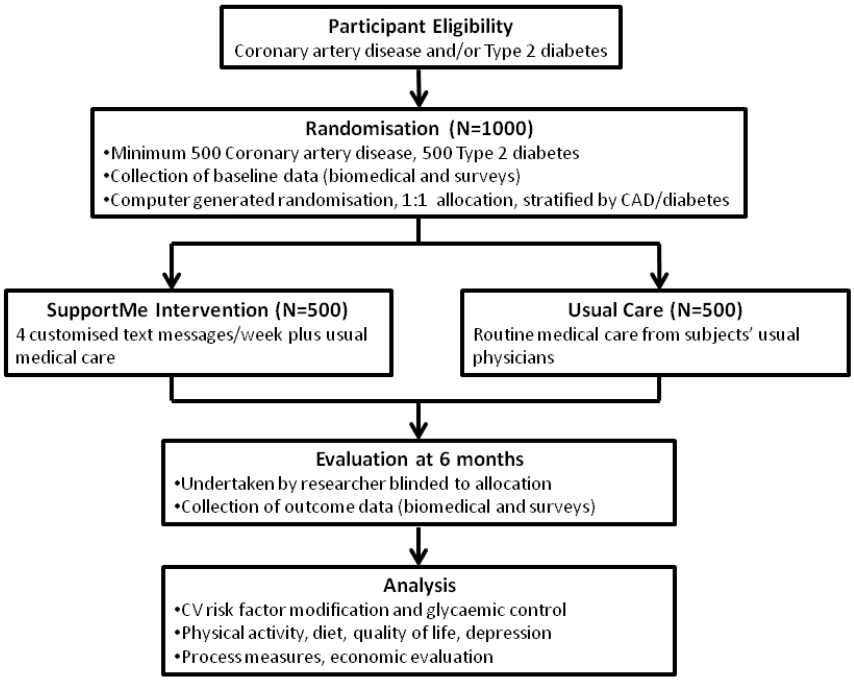

Figure 1: Summary of protocol

254x190mm (96 x 96 DPI)

Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the SPIRIT reporting guidelines, and cite them as:

Chan A-W, Tetzlaff JM, Altman DG, Laupacis A, Gøtzsche PC, Krleža-Jerić K, Hróbjartsson A, Mann H, Dickersin K, Berlin J, Doré C, Parulekar W, Summerskill W, Groves T, Schulz K, Sox H, Rockhold FW, Rennie D, Moher D. SPIRIT 2013 Statement: Defining standard protocol items for clinical trials. Ann Intern Med. 2013;158(3):200-207

		Reporting Item	Page Number
Title	#1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1
Trial registration	#2a	Trial identifier and registry name. If not yet registered, name of intended registry	3, 13
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	13
Protocol version	#3	Date and version identifier	4
Funding	#4	Sources and types of financial, material, and other support	16
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1, 16
Roles and responsibilities:	#5b	Name and contact information for the trial sponsor	N/A

sponsor contact information			
Roles and responsibilities: sponsor and funder	#5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	N/A
Roles and responsibilities: committees	#5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	13
Background and rationale	#6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	5-6, 14-15
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	8
Objectives	#7	Specific objectives or hypotheses	6, 14
Trial design	#8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, non-inferiority, exploratory)	6-7
Study setting	#9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	7
Eligibility criteria	#10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	7
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	8-10

Interventions: modifications	#11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving / worsening disease)	N/A
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	N/A
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	N/A
Outcomes	#12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	10-12
Participant timeline	#13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	10, Figure 1
Sample size	#14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	12
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	6-7
Allocation: sequence generation	#16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	7
Allocation concealment	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed	7

mechanism		envelopes), describing any steps to conceal the sequence until interventions are assigned	
Allocation: implementation	#16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	7
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	7, 10
Blinding (masking): emergency unblinding	#17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	N/A
Data collection plan	#18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	10-11
Data collection plan: retention	#18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	10
Data management	#19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	7, 10-11, 13
Statistics: outcomes	#20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	12
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	N/A
Statistics: analysis population and missing data	#20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple	N/A

		imputation)	
Data monitoring: formal committee	#21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	13
Data monitoring: interim analysis	#21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	N/A
Harms	#22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	10-11
Auditing	#23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	N/A
Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	13
Protocol amendments	#25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC / IRBs, trial participants, trial registries, journals, regulators)	N/A
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	7
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	N/A
Confidentiality	#27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	7, 8
Declaration of	#28	Financial and other competing interests for principal	16

interests		investigators for the overall trial and each study site	
Data access	#29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	13
Ancillary and post trial care	#30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	N/A
Dissemination policy: trial results	#31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	13
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	14
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	13
Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	Appendix
Biological specimens	#33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	N/A

BMJ Open

Text messaging support for patients with diabetes or coronary artery disease (SupportMe): Protocol for a pragmatic randomised controlled trial

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Text messaging support for patients with diabetes or coronary artery disease (SupportMe): Protocol for a pragmatic randomised controlled trial

N Wah Cheung[1,2,3]
Email: wah.cheung@sydney.edu.au

Julie Redfern[2,3]
Email: julie.redfern@sydney.edu.au

Aravinda Thiagalingam[1,2,3]
Email: aravinda.thiagalingam@sydney.edu.au

Tien-Ming Hng[4]
Email: tien-ming.Hng@health.nsw.gov.au

Sheikh Mohammed Shariful Islam[2]
Email: SIslam@georgeinstitute.org.au

Rabbia Haider[1,3]
Email: Rabbia.Haider@health.nsw.gov.au

Sonia Faruquie[1,3]
Email: Sonia.Faruquie@health.nsw.gov.au

Clara K Chow[1,2,3]
Email: clara.chow@sydney.edu.au

On behalf of the SupportMe investigators

[1]Westmead Hospital, Sydney, Australia

[2] The George Institute for Global Health, Sydney, Australia

[3] University of Sydney, Faculty of Medicine and Health, Westmead Applied Research Centre, Westmead Clinical School

[4]Blacktown Hospital, Sydney, Australia

Corresponding Author
N Wah Cheung
Dept of Diabetes & Endocrinology
Westmead Hospital
Westmead NSW 2145
Australia
Email: wah.cheung@sydney.edu.au
Telephone: 612 88906796

The SupportMe Investigators

David Burgess, Bridie Carr, N Wah Cheung, Jin Gun Cho, Clara K Chow, Michael Crampton, Sonia Faruquie, Cate Ferry, Rabbia Haider, Alison Hayes, Tien-Ming Hng, Sheikh Mohammed Shariful Islam, Stephen Leeder, Simon Raadsma, Julie Redfern, Chris Rissel, Aravinda Thiagalingam

ABSTRACT

Introduction

Low-cost interventions providing self-management support are needed for people with coronary artery disease (CAD) and diabetes. Mobile phone text messaging provides a potential vehicle for this. The SupportMe Trial aims to assess the feasibility of embedding a text-messaging program into routine clinical practice, and will determine if this improves cardiovascular risk factor and diabetes control amongst patients with CAD or type 2 diabetes.

Methods and Analysis

SupportMe is a randomised controlled trial to be conducted within the framework of a health district-wide integrated care program for people with CAD or T2DM. One thousand subjects will be recruited, with at least 500 in each group. Intervention subjects will receive 4 text messages a week for 6 months which provide advice, motivation, information and support for disease management and healthy behaviour. The primary outcome is systolic blood pressure at 6 months. Secondary outcomes include body mass index, waist circumference, low-density lipoprotein cholesterol, physical activity levels, dietary intake, quality of life, mood and smoking cessation, and for subjects with diabetes, glycosylated haemoglobin and fasting serum glucose. A process and economic evaluation will also be conducted.

Ethics and Dissemination

The study has been approved by the Western Sydney Local Health District Human Research Ethics Committee (AU RED HREC/16/WMEAD/331). Results will be disseminated via the scientific forums including peer-reviewed publications and presentations at national and international conferences.

Clinical Trials Registration

ACTRN12616001689460.

Trial Commencement and Completion

Commencement: March 2017

Anticipated completion: June 2019

Current protocol V4.0, December 2017.

Keywords

Randomised controlled trial, type 2 diabetes, coronary artery disease, text messaging

Word Count

3998

ARTICLE SUMMARY

Strengths and Limitations of this Study

- This trial investigates the feasibility of incorporating a text-messaging intervention into routine clinical care across an entire health district.
- This study tests the effectiveness of a single text-messaging program which can be customised for people with more than one chronic disease.
- This trial will be the largest study examining the effectiveness of text messaging support for people with type 2 diabetes.
- The text messages will be provided in English only.
- The study outcomes relate mainly to cardiovascular risk and diabetes control, and not hard clinical outcomes such as major cardiovascular events.

INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of death globally, accounting for 40 million, or 70% of the total deaths globally in 2015, rising by 14% since 2005[1]. Cardiovascular disease (CVD) accounts for almost half of the NCD deaths. Diabetes caused 4% of the NCD deaths, but its impact is growing rapidly, up by 32% since 2005[1]. The International Diabetes Federation estimated the prevalence of diabetes worldwide was 8.3% in 2014, and projected to increase to 9.9% by 2030, to affect more than 500 million people[2].

The major modifiable determinants of CVD are tobacco smoking, and the related risk factors of physical inactivity, unhealthy diet, hypertension, hypercholesterolaemia, and diabetes[3]. The incidence of CVD can be reduced by treatments and strategies which address these risk factors[3,4]. Early glucose and blood pressure control amongst people with type 2 diabetes may reduce mortality and diabetes complications[5,6]. Despite substantial evidence of clinical benefits, existing interventions are under-utilized and poor adherence to exercise, diet and smoking cessation are problematic[7]. Hypertension is one risk factor common to both people with CVD and type 2 diabetes that is often inadequately managed. We have previously shown that without support, blood pressure control deteriorates amongst patients with coronary artery disease following discharge from hospital cardiac services[8]. Even patients with diabetes who attend specialist practices often have elevated blood pressure and fail to meet guideline targets[9,10].

Information and communication technologies have great potential for the delivery of preventative and educational healthcare programs at a large scale and at low cost[11]. A systematic review reported that such technology used in the detection and follow up of CVD provided better clinical outcomes, mortality reduction and lower health services utilization[12]. Systematic reviews have also found that text-message interventions almost double the likelihood of short-term smoking cessation[13] and medication adherence[14], and have provided some evidence of modest effects on weight loss[15,16], hypertension[16] and physical activity[16,17]. Previous trials of text messaging for people with diabetes have

generally been small but show promise for the improvement of glycaemic parameters[16,18-20]. However apart from smoking cessation, these programs have not been widely implemented or translated into routine healthcare for patients. Moreover, previous trials have generally focused on single diseases or conditions.

The Tobacco, Exercise and Diet Messages (TEXT ME) study of 710 patients with coronary heart disease (CHD) was the first randomised controlled trial which demonstrated that a text messaging program providing motivation, support and education improved multiple clinical risk factor measures including LDL-cholesterol, blood pressure, body mass index (BMI), physical activity and smoking cessation[8]. As part of our long-term goal of developing a text messaging program for people with different or multiple chronic diseases, we have adapted the TEXT ME intervention to undertake a text messaging support program for people with 2 different chronic diseases, namely type 2 diabetes or coronary artery disease (CAD), or both. The intervention will provide education, clinical management support and healthy lifestyle motivation, with the aim of improving cardiovascular risk factors, in particular blood pressure, and diabetes care.

Widespread delivery of text-message based education and support programs requires the intervention to be embedded into routine clinical care for people with chronic disease. This paper describes the protocol for the SupportMe randomised controlled trial. A major goal of SupportMe was to identify and address key questions in the implementation of text-message based education and support program into our existing health systems. Our test bed was the Western Sydney Local Health District (WSLHD) which serves a population of ~970,000 in Western Sydney, Australia.

METHODS AND ANALYSIS

Study Design, Setting and Population

SupportMe is a pragmatic randomised clinical trial of 1000 patients with CAD and/or type 2 diabetes (Fig 1). The study will be conducted in the ethnically and culturally diverse WSLHD.

Participants will be recruited via referrals from the community and hospital setting. We will leverage the framework of the Western Sydney Integrated Care Program (WSICP)[21] which involves over 200 general practitioners and 50 hospital clinicians to encourage referral to the SupportMe program. The WSICP seeks to improve health outcomes for patients with chronic disease and improve the continuity of care across hospital and primary care services across the health district.

The program will be advertised to hospital clinicians via internal hospital communication pathways and to general practitioners (GPs) through the Western Sydney Primary Health Network (which supports GPs). We will provide a variety of referral options including traditional letter-based referrals, fax, phone, email, SMS as well as e-referral through an internet portal.

To be eligible, subjects need to be 18 years or older, with i) CAD, defined as history of prior myocardial infarction or documented >50% occlusion of a major coronary artery on coronary angiography, and/or ii) type 2 diabetes, with an HbA1c in the last 6 months of 7.1%-11.4% (54-101 mmol/mol). Subjects need to own a mobile phone and be able to read text messages in English. We will allocate each referred patient with a screening ID number and maintain a "screening log" of referred subjects, which records basic demographic data, as well as the referral source. We will also record reasons for ineligibility and non-participation. Research assistants will assess the eligibility of subjects referred subjects, explain details of the study, and obtain consent from those who wish to proceed into the study. For subjects who enter the SupportMe trial, we will keep an "enrolment log" and we will notify their referring clinician and their GP (if this was not the referrer).

Randomisation

Randomisation will be in a uniform allocation of 1:1, stratified by health condition (CHD, Diabetes or both), and performed through an electronic platform. Personnel collecting baseline data will be blinded to treatment allocation. The computerised platform will connect with the text messaging platform to commence sending messages to the intervention subjects automatically based on randomisation. To minimise un-blinding at

follow-up, participants will be sent a message reminding them not to reveal treatment allocation to follow-up data collectors.

The secure web-based Research Electronic Data Capture (REDCap) web application will be used for participant registration and data collection. Each subject in the study will be assigned a unique study identification number in REDCap, and their name, initials, date of birth and contact details will not be recorded to ensure that the dataset is de-identified.

Intervention and Control

The SupportMe intervention is a simple patient-centred intervention designed to provide semi-personalised and customised support in clinical and lifestyle management, as an adjunct to standard care provided by the subjects' usual healthcare professionals. Participants allocated to intervention will receive four text messages per week sent at random times between 9am and 5 pm during weekdays, over a 6 month period. These will be unidirectional, in that subjects will be sent messages but be advised that there is no expectation that they respond back nor is there a facility to interact with or discuss their specific health issues with the study team. However, a researcher will monitor messages sent from participants, and a record of these will be maintained. Where there are return messages which are a potential cause for clinical concern, the message will be escalated to a doctor for review. This researcher will not participate in any other data collection or individual level of analysis.

Control subjects will only receive a welcome message at the initiation of their participation in the trial, and a message at 6 months reminding them of their follow-up appointment. It is expected that both intervention and control participants will continue receiving usual care from their regular health professionals.

All participants will be offered brief training at enrolment on how to read a text message and how to delete or save messages. Participants may withdraw from the study at any time via text message; in which case a team member will contact the participant for confirmation and delivery of text messages to these subjects will be deactivated.

At the end of the 6 month program, maintenance messages will be sent to intervention subjects for a further 6 months at a frequency of 2 per week. Control subjects will be offered the opportunity to receive the SupportMe intervention at that point.

SupportMe Message Content

The text message content and program structure was developed according to our previously published process[22]. The text messages provide advice, motivation, information and support for disease management, monitoring of risk factors, and tips and links to engage in healthy behaviours. Each of the 4 messages the intervention subjects receive each week will focus on a different aspect of healthcare, namely (1) general health, (2) nutrition, (3) physical activity, (4) disease self-management. A different set of 4 message banks was developed for each of the 3 strata in the study; CAD, diabetes, and CAD with diabetes, though there are a number of messages common to the 3 strata. In addition, there are subsets of messages which enable a degree of customisation. These are smoker and non-smoker, insulin user and non-insulin user, vegetarian and non-vegetarian. Messages from each bank will be sent in a random order until 26 weeks has passed.

Existing validated messages which were used in the TEXT ME trial were reviewed for use in SupportMe. Additional SupportMe messages, mainly related to diabetes, were developed by a working group including endocrinologists, diabetes educators, dietitians, podiatrists, and clinicians in primary care, community health, population health, existing health promotion programs and consumers. The process followed was similar to that applied to the TEXT ME program[22,23], whereby the working group initially developed the text messages, then these were reviewed for readability and to ensure messages were presented with a positive focus. The text messages were modified based on feedback from the diabetes working group, and then underwent user testing with feedback and further modification. Examples of final text messages include: "*Did you exercise today?", "Has your Dr checked & discussed your cholesterol levels with you recently? These need regular review*", *"Healthy eating means at least 5 serves of vegetables & 2 serves of fruit every day", "If your sugars are regularly under*

4mmol/L or over 10mmol/L, it may be time to review your diabetes treatment - speak to your Doctor".

Our TEXT ME message management engine will deliver the messages for SupportMe. It selects messages from message banks as per prespecified algorithms using patient baseline data entered into the message management system. The engine sends messages through a telecommunications gateway to enable them to be sent to all participants on any Australian phone network at no cost to the participant and at a bulk-rate cost to the study.

Study Outcomes

The primary outcome of the study is systolic blood pressure (sBP) after 6 months. This will be measured by a digital sphygmomanometer, three times in the sitting position, with the mean of the last 2 readings being recorded. Secondary outcomes include body mass index, waist circumference, fasting low-density lipoprotein cholesterol, physical activity (measured by the Global Physical Activity Questionnaire[24]), quality of life (measured by the 12 item short form (SF-12) health survey[25]), depression (measured by the Patient Health Questionnaire-9 depression scale[26]) and dietary intake (measured by the dietary component of the WHO STEPS instrument[27]), smoking cessation and medication use. Subjects with diabetes will also be evaluated for the additional secondary outcomes of HbA1c and fasting serum glucose. A composite outcome of guideline levels of risk factors achieved will also be analysed. Surveys and measurements will be conducted in face-to-face visits with research assistants who will be blinded to the subject's treatment allocation.

The protocol requires the closing study visit to be undertaken within one month of the 6 month time point. Study visits performed more than one month later will be regarded as protocol deviations, but nonetheless we will endeavour to capture the outcome data.

Process Measures

Process data will be collected from referral information, participant surveys, focus groups and analytical information. The screening log will collect information regarding the source of referrals to SupportMe, to enable an assessment of its integration into the WSICP and level of clinician engagement. The screening log will also provide data for reasons that subjects

were not enrolled into the SupportMe program. Analytical data extracted from the message software system will provide information about the time that messages are sent and the proportion of text messages successfully delivered (eg, if mobile phone mail boxes are full) will be recorded. A log will be kept of non-protocol participant contact with the study team, the reason for contact and the method used for contact (eg, by telephone, email).

SupportMe participants allocated to the intervention group will be administered a User Survey at the 6-month follow-up assessment. This questionnaire explores the acceptability of the text messages, identification of which messages participants remembered, liked or disliked, what they did with messages (eg, kept them or deleted them immediately), their perceived utility of the text messages and their opinion regarding the intrusiveness, timing, language and content suitability of the text messages. To obtain a more in-depth understanding of the potential barriers and facilitators for integration into existing health services and individual level to uptake of this program, we will also conduct purposive semi-structured interviews with a subsample of participants in the intervention group. Sampling will continue until thematic saturation occurs. We anticipate from previous experience the need to conduct approximately 20 patient interviews. Our research group has extensive experience conducting such evaluations alongside RCTs.

Economic Evaluation

We will conduct a cost-effectiveness and cost-utility analysis of SupportMe from a health sector perspective. The costs and health outcomes associated with the intervention will be compared in an incremental cost-effectiveness analysis. Direct health care costs will be determined by patient-level data linkage to the Medical Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS). The MBS and PBS are government funded schemes which provide subsidies for non-hospital attendances to healthcare providers (eg: general practitioners, specialists and some allied health providers such as dietitians), and for pharmaceutical agents respectively. Cost of hospitalisations will be determined from hospital admission records. We will use the SF-12 to determine Quality Adjusted Life Years (QALYs) in a trial based cost-utility analysis. Observed changes in clinical risk factors e.g. LDL-cholesterol will inform longer term modelling of serious events and hospitalisations over a

lifetime and thus estimate longer term costs, and cost-effectiveness of the intervention. For type 2 diabetes, patient-level risk factors will include measures of HbA1c which will be used in a validated health economic model. The per patient costs of intervention delivery will be used to estimate total costs of scaling up the SupportMe program at a state or national level.

Serious Adverse Events

We will record serious adverse events (SAEs) which are fatal, life-threatening, medically important, result in hospitalisation or prolongation of hospitalisation, or cause disability or incapacity. The Clinical Endpoint Adjudication Coordinator will determine whether the event will need adjudication. SAEs related to diabetes or cardiac disease will be adjudicated by an independent physician.

Statistical analyses

We plan to recruit 1000 subjects into the study, with at least 500 patients with each of diabetes or CHD. A sample of 1000 subjects will enable detection of a 3.5 mmHg difference in sBP with 90% power and no loss to follow up (Type 1 error 5%, 2 sided alpha and assuming a conservative standard deviation (SD) of 17) and 80% power if there was approximately 20% loss to follow-up. If the SD of 12mmHg from our earlier TEXT ME study[8] was applied, a sample size of 720 subjects has 90% power to detect a difference of 2.5 mmHg with no loss to follow-up, but with 20% loss to follow-up, 900 subjects would be required. Within the strata of diabetes or CHD, a sample size of 500 and accounting for 20% loss to follow-up, would have 80% power to detect a 5 mmHg difference in sBP (SD 17 mmHg) and 80% power to detect a 3.5 mmHg difference assuming a SD of 12 mmHg. Data from the Blood Pressure Lowering Treatment Trialist's Collaboration indicate that a reduction in BP of 5 mmHg reduces the risk of major cardiovascular events, irrespective of the form of pharmacotherapy[28]. We also planned for an adequate sample size to demonstrate an improvement in diabetes control, as measured by HbA1c. Applying local data regarding the distribution of HbA1c[9], a sample size of 500 without loss to follow-up is required for 80% power to detect a difference of 0.3% in HbA1c in the diabetes cohort

(SD=1.2), but if allowing for 20% drop-out, the required sample size increases to 625. This quantum of HbA1c reduction translates to a 6% reduction in risk of diabetes complications[29]. As we expect >20% of CHD patients to also have diabetes, there will be at least 600 patients with diabetes in the total 1000 subject cohort.

The study will follow intention-to-treat principles for analyses. Participants will be analysed at 6 months by original assigned groups. The primary analysis will use analysis of covariance (ANCOVA) adjusting for baseline sBP. To explore the treatment effect by prespecified risk factors, namely baseline high/low BP, BMI groupings, high/normal LDL-cholesterol, high/normal HbA1c, whether they had background BP lowering therapy, ethnicity group, age groups, gender, participation in WSICP and medical conditions, a model of 6 month sBP will be performed adjusting for baseline sBP, treatment, risk factors and the interaction of each risk factor with treatment. The modelled mean differences with 95% confidence intervals for each risk factor will be presented in a forest plot together with tests of interaction to assess whether the treatment effect varies between levels of each risk factor.

The pattern of missing data for the primary and subgroup analysis will be explored to assess if some baseline characteristics predict missing sBP or HbA1c at 6 months using a log binomial regression analysis. The study will be reported following CONSORT2010 guidelines[30].

Patient and Public Involvement

Diabetes NSW & ACT, the peak consumer diabetes organisation in the state of New South Wales, participated in the development of the text messages. The text messages relating to coronary artery disease had previously been tested and assessed for acceptability in the TEXT ME trial[8]. Ten patients with diabetes were surveyed prior to the study to obtain feedback regarding the draft new diabetes related text messages. This feedback was considered and messages modified or discarded accordingly.

ETHICS, GOVERNANCE AND DISSEMINATION

The study has been approved by the Western Sydney Local Health District Human Research Ethics Committee. The study will adhere to the National Health and Medical Research Council ethical guidelines for human research. Written and informed consent will be obtained from all participants. The trial has been registered with the Australian New Zealand Clinical Trials Registry, ACTRN12616001689460. This includes all items from the World Health Organization Trial Registration Set.

The study will be administered by the George Institute and the University of Sydney, with the design and conduct overseen by a project management committee. This committee has expertise in large-scale clinical trials and qualitative research, economic analysis, clinical CVD and diabetes management and healthy policy implementation at both a local and national level. It includes investigators and partners in the program. The program will also report to the WSICP Steering Committee.

A data monitoring safety board comprising a clinician with expertise in diabetes, and a second with expertise in cardiology will evaluate all serious adverse events. A manual of procedures has been developed, outlining study procedures including definitions, study organisational structure, quality control, procedures for collection and recording of data, monitoring and audit of the study, procedures for patient withdrawal, non-compliance and protocol violations.

Only the chief investigators (NWC, JR, AT, TMH, CKC) and trial statistician will have access to the final de-identified dataset. The full protocols and de-identified dataset will be made available from the investigators on reasonable request, and subject to ethics approvals. The findings of this study will be disseminated via the usual scientific forums, including peer-reviewed publications and presentations at national and international conferences. Authorship will be based on the International Committee of Journal Editors guidelines. We have followed the SPIRIT reporting guidelines[31].

CONCLUSION

SupportMe will develop new evidence as to whether a single text messaging support program will improve clinical parameters for people with different chronic diseases, namely cardiovascular disease and diabetes, and whether this can be successfully implemented into a wider chronic disease program. The project will also provide an economic analysis and understanding of cost as well as barriers and enablers associated with implementation and patient satisfaction.

Information technology and communication are considered key enablers of successful integrated care programs[32]. However, this has largely focused on the use of information systems and communication between healthcare providers, rather than between the healthcare program and the patient. The mobile phone is increasingly being recognised as a simple everyday technology which can be used to provide information and self-management support directly to patients. Simple texting programs administered by computerised message management systems make them affordable, scalable and practical to deliver as an adjunct to our existing health services. There are already data that text-messaging can effectively improve clinical outcomes or parameters by supporting people with chronic diseases and conditions such as CVD, asthma, smoking and medication adherence[12,33]. Previous data for diabetes has been mixed, and based on small trials, but a recent large randomised controlled trial has shown that a comprehensive text-messaging based diabetes support program significantly reduced HbA1c[34].

The challenge now is to develop and test text-messaging interventions which are adaptable to people with different or multiple chronic diseases, and to implement these as a part of routine care. Indeed, with the high prevalence of chronic diseases, large scale population health interventions are required. The low cost of text-messaging systems without the need for routine input from a health professional, makes them ideally suited for this purpose. In Australia, 50% of the population has at least one of eight chronic diseases, and half of these people have at least two such conditions[35]. Cardiovascular disease is the disease group

responsible for the highest expenditure[35]. With a high prevalence of chronic disease, and many people having multiple diseases, it is impractical for a patient to enrol in a separate text-messaging program for each of their chronic conditions, or for busy clinicians to manage the complexity of referring their patients to different text-messaging programs. SupportMe tests the effectiveness of an intervention for people with either CVD or diabetes, or both disorders, and paves the way for a multifaceted text-messaging support program to be developed. A single text-messaging system, which includes multiple customised modules for people with other prevalent chronic diseases such as chronic obstructive pulmonary disease, chronic kidney disease, and mental health disorders, as well as any combination of these disorders would be highly desirable.

For these individuals, better preventative care and fostering of self-management will decrease the need for access to tertiary services and hospitalisation. Provision of text-message programs at the point of hospital or community health engagement will enable the health service to support larger numbers of patients at a low-cost, enhance patient involvement with their care and their perception of the health service supporting them.

A limitation of our program is that messages will be delivered in English only, and in a multicultural society such as Australia, we need to overcome language barriers to healthcare. We intend to develop messages in other languages for future text-messaging programs we plan to undertake. However, this is not a process of simple translation, as the messages need to be culturally and linguistically appropriate for each individual language group, and undergo a rigorous process of testing[36].

In summary, by conducting SupportMe within the framework of the WSICP, and encouraging referrals from clinicians involved in the clinical services offered by the WSICP, we will be testing if a text-messaging program can be successfully implemented as standard care for patients in a chronic disease integrated care program which runs across a large health district, and improve clinical outcomes. Ultimately, for a mobile health initiative to be successful beyond the life of a clinical trial, it has to be a part of standard care. This requires support from fund-holders in health services, to support it as part of a larger program, rather than being a stand-alone intervention.

Author contributions

CKC, NWC, SMSI, JR, and AT conceived the original study concept. All authors (CKC, NWC, SMSI, JR, AT, TMH, RH, SF) contributed to the design of the study, protocol development, its implementation, and drafting of the manuscript.

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Competing Interests

None

Acknowledgements

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Statement of License to BMJ

Figure Legend

Figure 1. Study flow diagram. CAD, coronary artery disease.

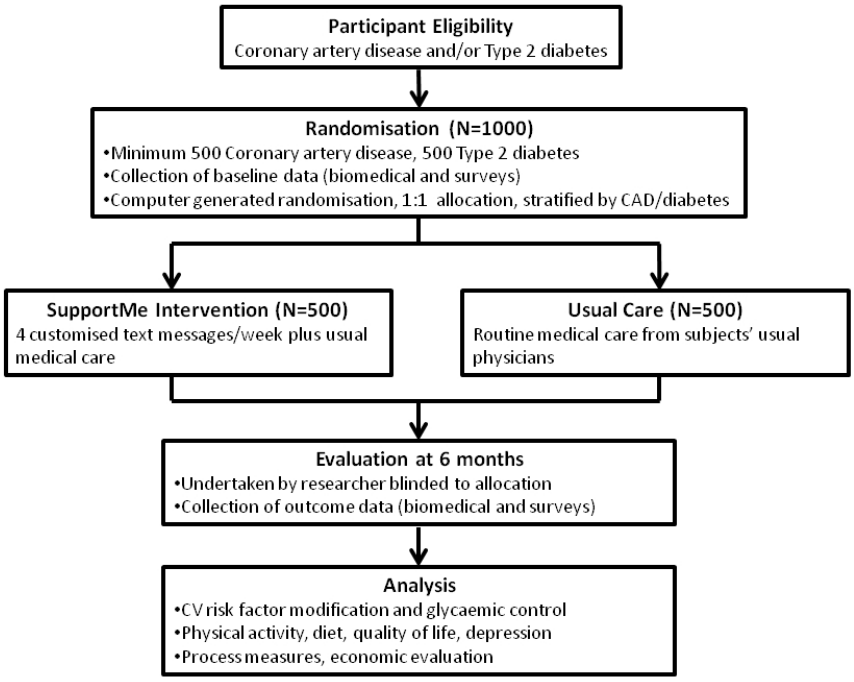

Figure 1: Summary of protocol

254x190mm (96 x 96 DPI)

Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SPIRIT reporting guidelines, and cite them as:

Chan A-W, Tetzlaff JM, Altman DG, Laupacis A, Gøtzsche PC, Krleža-Jerić K, Hróbjartsson A, Mann H, Dickersin K, Berlin J, Doré C, Parulekar W, Summerskill W, Groves T, Schulz K, Sox H, Rockhold FW, Rennie D, Moher D. SPIRIT 2013 Statement: Defining standard protocol items for clinical trials. Ann Intern Med. 2013;158(3):200-207

		Reporting Item	Page Number
Title	#1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1
Trial registration	#2a	Trial identifier and registry name. If not yet registered, name of intended registry	3, 13
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	13
Protocol version	#3	Date and version identifier	4
Funding	#4	Sources and types of financial, material, and other support	16
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1, 16
Roles and responsibilities:	#5b	Name and contact information for the trial sponsor	N/A

sponsor contact information			
Roles and responsibilities: sponsor and funder	#5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	N/A
Roles and responsibilities: committees	#5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	13
Background and rationale	#6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	5-6, 14-15
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	8
Objectives	#7	Specific objectives or hypotheses	6, 14
Trial design	#8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, non-inferiority, exploratory)	6-7
Study setting	#9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	7
Eligibility criteria	#10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	7
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	8-10

Interventions: modifications	#11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving / worsening disease)	N/A
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	N/A
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	N/A
Outcomes	#12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	10-12
Participant timeline	#13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	10, Figure 1
Sample size	#14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	12
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	6-7
Allocation: sequence generation	#16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	7
Allocation concealment	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed	7

mechanism		envelopes), describing any steps to conceal the sequence until interventions are assigned	
Allocation: implementation	#16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	7
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	7, 10
Blinding (masking): emergency unblinding	#17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	N/A
Data collection plan	#18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	10-11
Data collection plan: retention	#18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	10
Data management	#19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	7, 10-11, 13
Statistics: outcomes	#20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	12
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	N/A
Statistics: analysis population and missing data	#20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple	N/A

		imputation)	
Data monitoring: formal committee	#21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	13
Data monitoring: interim analysis	#21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	N/A
Harms	#22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	10-11
Auditing	#23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	N/A
Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	13
Protocol amendments	#25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC / IRBs, trial participants, trial registries, journals, regulators)	N/A
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	7
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	N/A
Confidentiality	#27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	7, 8
Declaration of	#28	Financial and other competing interests for principal	16

interests		investigators for the overall trial and each study site	
Data access	#29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	13
Ancillary and post trial care	#30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	N/A
Dissemination policy: trial results	#31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	13
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	14
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	13
Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	Appendix
Biological specimens	#33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	N/A