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Impact of removing prescription charges on health outcomes: protocol for a randomised controlled trial

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Title

Impact of removing prescription charges on health outcomes: protocol for a randomised controlled trial

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ABSTRACT

Introduction. Prescription charges prevent many people from accessing the medicines they need to maintain or improve their health. In New Zealand, where most people pay $5 per prescription item, Māori and Pacific peoples, those living in most deprived areas and those with chronic health conditions are the most likely to report that cost prevents them from accessing medicines.

Methods and analysis. This randomised controlled trial will evaluate the effect of removing prescription charges on health outcomes and health care utilisation patterns. We will enrol 2,000 participants: half will be allocated to the intervention group and we will pay for their prescription charges for 12 months. The other half will receive usual care. The primary outcome will be hospital bed-days. Secondary outcomes will be: all-cause and diabetes/mental health-specific hospitalisations, prescription medicines dispensed (number and type), deaths, emergency department visits, and quality of life as measured by EQ-5D-5L. Costs associated with these outcomes will be compared in an economic sub-study. A qualitative sub-study will also help understand the impact of free prescriptions on participant well-being, using in-depth interviews.

Discussion. Being unable to afford prescription medicines is only one of many factors that influence adherence to medicines, but removing prescription charges is relatively simple and in New Zealand would be cheap compared to other policy changes. This RCT will help identify the extent of the impact of a simple intervention to improve access to medicines on health outcomes and health service utilisation.

Ethics and Dissemination. This study was approved by the Central Health and Disability Ethics Committee (NZ) in July 2019 (19/CEN/33). Findings will be reported in peer-reviewed

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publications, as well as in professional newsletters, mainstream media and through public meetings.

Trial Registration. Australian New Zealand Clinical Trials Registry (ANZCTR): ACTRN12618001486213p.

Protocol v1 (4 September 2018). All updates registered with ANZCTR.

ARTICLE SUMMARY

Strengths and limitations of this study

- This RCT is the first to test the effect of eliminating prescription charges on health outcomes, in isolation from other interventions
- The study targets people who are most likely to experience financial barriers to accessing medicines, including indigenous and ethnic minority populations
- Unfortunately, there is no centralised method for implementing the intervention, so it relies on pharmacists to provide the intervention
- Primary care data are not consistently recorded on a national level, so outcomes such as primary care visits cannot be included.

INTRODUCTION

Background

While the majority of middle and high-income countries are able to provide their populations with high-quality health services, not all social groups benefit equally from the services offered. Poorer access to health care and negative experiences in the healthcare system can lead to adverse outcomes for some people [1] and addressing inequalities in health outcomes remains a key issue for many governments.

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In New Zealand, Māori (the country's indigenous population), Pacific people and other minority groups experience barriers to accessing prescription medicines and other care. It has been estimated that if Māori were to receive prescription medicines at the same rate as non-Māori, non-Pacific people with similar burden of disease, Māori would get over one million more prescriptions per year, equivalent to a 41% shortfall in medicines that should have been dispensed [2]. Less is known about rates of medicine use by Pacific people, but almost a fifth of Pacific adults report prescription charges prevent them from accessing medicines [3]. There are likely to be many complex reasons for this, which are difficult to address, but there is also a simple, policy-amenable barrier: prescription charges [4].

As in other high-income countries, the design of the prescription charges regime in New Zealand and the level of charges have changed multiple times since they were introduced in the 1980s. A brief overview of current prescription charges in New Zealand is presented in Box 1. Despite the numerous changes, there is little evidence to inform future policy changes. There are strong arguments for keeping prescription charges for the majority of the population, such as reducing waste, encouraging people to value medicines, and offsetting the cost of medicines. However, there are also strong arguments that, for some people, prescription charges may lead to significant worsening of health and increased use of other, more expensive services, such as publicly-funded inpatient hospital care.

Current prescription charge regime in New Zealand

Medicines Cost: New Zealanders pay a variety of charges for their medicines, which cover all or part of the cost of the medicine, dispensing fees and additional fees such as for blister packing. Some medicines are unsubsidised, so patients pay the whole cost plus a dispensing fee; others are partially subsidised so people pay a part-charge and a dispensing fee. However, most people pay only a standard $5 "prescription charge" (or co-payment) for each prescription item, regardless of the actual cost of the medicine.

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Exemptions: There are very few exemptions for the prescription charges. Children under 14 years old are exempted and there are no exemptions based on low income. Some pharmacies absorb the $5 charge to attract customers (for the pharmacy or supermarket in which they are located). Individuals or families are exempt from prescription charges after they pay for 20 items in one calendar year but there is evidence that most people do not know about this exemption and some continue to be charged the co-payment [5 6]. Repeat prescriptions usually do not incur $5 prescription charge.

Box 1. Description of the current prescription charges regime in New Zealand.

Numerous studies have shown that increasing the amount people pay for prescriptions leads to decreased use of prescription medicines [7-9]. Furthermore, amongst some patient groups, increased prescription charges lead to poorer health status [10] and higher use of other healthcare [7 11 12], although the quality of evidence is generally low [9]. Previous research by the authors and others in New Zealand has shown that people report that prescription charges prevent them picking up medicines [13 14] and that pharmacists frequently encounter people who cannot afford their medicines [15]. Analysis of SOFIE (Statistics New Zealand's Survey of Family, Income and Employment) data suggests that inability to afford prescription medicines is associated with a decline in self-reported health status [16]. In many countries, such as England and Australia, people on low incomes or those with chronic conditions pay less than the general population for their prescriptions. While these policies seem to acknowledge that cost is a barrier to accessing medicines for certain groups of people, very few studies have explicitly tested this hypothesis.

Although $5 per prescription item is low by international standards [17 18], there are no exemptions for people on low incomes and New Zealanders usually also pay for primary care consultations (usually NZ$15-NZ$50 [19]); thus prescription charges are an additional barrier to primary healthcare. As New Zealand has a high level of income inequality and poverty [20 21], there are many people on very low incomes for whom prescription charges can

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be a barrier to accessing medicines. In the latest NZ Health Survey, 5.1% of the adult population, including 12.7% of Māori and 14% of Pacific peoples, reported not picking up at least one medicine in the last 12 months because of cost. Those who lived in the most deprived areas were more than six times as likely to report this as those in the least deprived areas [3]. The aim of this study is therefore to determine whether removing this barrier (i.e., the standard $5 prescription charge) leads to decreased use of hospital and other services by people living in areas of high deprivation and with high health needs.

The study will evaluate the effect of removing prescription charges on the usage of publicly-funded healthcare services. It will compare the health outcomes and health care utilisation patterns of those who pay standard prescription charges with those who receive free prescriptions. Such an experimental study has not been done in New Zealand (and very seldom done overseas). If the study shows that removing prescription charges for some groups of people was beneficial, it would be feasible and relatively straightforward to introduce and implement a policy change in New Zealand.

METHODS AND ANALYSIS

The SPIRIT reporting guidelines were used in the development of this study protocol[22]. The checklist is available as a supplementary file.

Trial design

The study will employ two-group parallel randomised controlled trial design across three geographical areas, with participants equally randomised to having their prescription charges paid for a year or usual care. Upon recruitment into the study, participants will complete an interviewer-administered questionnaire covering demographics, health status

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(including EQ-5D) and health service use so that the study population can be described and the success of randomisation assessed. Following the 12-month intervention period, hospital bed-days and other secondary outcomes for the groups will be compared between the intervention and control groups.

A diagram depicting the recruitment and data collection process, as provided to participants in the study information sheet, is shown in Figure 1. The SPIRIT diagram is presented in Table 1.

[Insert Figure 1 here.]

Figure 1. Diagram of inclusion, recruitment and procedure, as provided to all potential participants.

Table 1. SPIRIT diagram for RCT of prescription payment charges: schedule of enrolment, interventions and assessments.

	STUDY PERIOD					
	Enrolment	**Allocation**	**Post-allocation**			**Close-out**
TIMEPOINT	***Oct-Dec 2018 -t_1***	**Oct-Dec 2018 0**	***Feb 2019 t_1***	***Jul 2019 t_2***	***Jan 2020 t_3***	***Feb-Mar 2020 T_4***
ENROLMENT:						
Eligibility screen	X					
Informed consent	X					
ID card (intervention group)		X				
Allocation		X				
INTERVENTIONS:						

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Prescription payments			↔	↔	↔	
Usual care			↔	↔	↔	
ASSESSMENTS:						
EQ-5D	X	X		X	X	
Hospital bed-days; hospitalisations				X	X	X
Dispensing data, other health services use data			X	X	X	X

Patient and public involvement statement

Prior to undertaking this study, previous qualitative research by PN highlighted the financial barriers many people faced when getting their medicines. A feasibility study was then conducted which aimed to determine the most relevant and appropriate study areas, participant inclusion/exclusion criteria, participant recruitment strategies, and prescription payment methods. During the feasibility study, focus groups were conducted with people who resembled our future participants in terms of age, ethnicity, and health and social conditions, in order to gain insight into the most acceptable and effective methods of recruiting participants and paying for their medicines. At the beginning of the study, a focus group of people similar to our study participants provided valuable feedback on the participant information sheet in order to make it clearer and easier to understand. Health providers, pharmacists and local community organisations were also consulted during the feasibility study and prior to the beginning of participant recruitment. They are also involved in contacting potential participants and in providing space for recruitment events.

At the end of the study, we will consult local health providers and community organisations again in order to make sure that we disseminate the study findings to participants and their communities in a way that is both culturally appropriate and effective.

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Participants

The study population will be people living in the most deprived areas who have either type 2 diabetes, for which they take medication, or on-going mental health problems, for which they take anti-psychotics. This population has been chosen because individuals are at high risk of not being able to afford their medicines, i.e., they are likely to require large numbers of medicines and to have low incomes. We are aware that people with serious on-going mental health problems may stop taking their medicines for a range of reasons, one of which is inability to afford them. This study will only determine what difference prescription charges make. Potential participants will be recruited through organisations that serve and/or represent them. The feasibility study that we conducted prior to the study suggested that there are considerable advantages in recruiting people in group settings, and through organisations they know and trust.

Inclusion criteria. To be eligible for the study, participants must:

- be at least 18 years old;
- be able to communicate in English;
- have a diagnosis of type 2 diabetes with treatment requiring medication AND/OR be taking at least one anti-psychotic medication;
- reside in one of three territorial authorities: Dunedin City, Porirua City, or Tairāwhiti District; and
- have a physical address in a census area unit categorised as NZDep 8, 9, or 10. (Note: NZDep is an area-based socioeconomic deprivation score, with NZDep 8, 9, and 10 indicating the most deprivation [23].)

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Exclusion criteria. Participants will be excluded if they do not provide written consent to access pre-specified medical information using their unique person identifier for health services, the National Health Index (NHI) number [24].

Study settings

To ensure ethnic and rural-urban diversity and sufficient numbers of potential participants, the study will be carried out in three geographical regions: Dunedin City, Porirua City, and Tairāwhiti District. Dunedin City is a medium-sized city with a predominately New Zealand European population. Porirua City is a satellite city of the country's capital, Wellington. It has significant proportions of Māori and Pacific peoples. The Tairāwhiti District is primarily rural, with a predominantly Māori population and a small city (Gisborne). Demographic characteristics of the study sites are presented in Table 2.

Table 2. Population, ethnicity and deprivation of study areas

	Territorial Authority		
	Dunedin City	**Porirua City**	**Gisborne District**
Census usually resident population (2013)	**120,246**	**51,717**	**43,656**
Māori (%)*	8,865 (7.4)	10,131 (19.6)	19,683 (45.1)
Pacific (%)*	2,826 (2.4)	12,738 (24.6)	1,539 (3.5)
NZDep2013: 8, 9, 10 census area units	**29,862**	**25,605**	**28,191**
Maori (%)*	2,700 (9.0)	7,116 (27.8)	15,606 (55.4)
Pacific (%)*	1,113 (3.7)	11,064 (43.2)	1,311 (4.7)

*Ethnicity count based on grouped total responses
Population data retrieved from Statistics New Zealand 2014. 2013 Meshblock dataset [25].
NZDep data retrieved from University of Otago Wellington. NZDep2013 census area Unit data [26].

Intervention

The intervention group will be exempted from $5 prescription charges for one year. Ideally, participants would be identified in a national dataset, so they were automatically exempt

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from payment when they received their prescription medicines. Unfortunately this is impossible so instead participants will be given a photo ID card indicating they are in the study, and pharmacies will be given lists of names and NHI numbers of participants in their geographical region. Pharmacists will be asked to tag participants in their computer systems and to keep the list for use throughout the study. We will visit pharmacies throughout the study period to ensure that the list is still accessible and usable. The Pharmacy Guild of New Zealand, which represents many community pharmacy owners, has also offered to notify its members about the study, in case study participants travel outside their region. The study's free-phone number and e-mail address will be supplied to pharmacies and participants, to contact us in case of any disputes or confusion. During the feasibility study we trialled this system in Tairāwhiti and it worked well.

We have established good relationships with pharmacies in the study areas and are confident that they will assist with the study. When prescriptions are dispensed for the study participants in the intervention group, the $5 charge will be billed to the study. Participants will need to pay for other charges such as blister packing, part-charges, and the full cost of unsubsidised medicines. This is in line with the likely policy outcome if the study finds a benefit, which is the exemption of certain population groups from the $5 charge. Participants and pharmacies will also be instructed that the study funding can only be used to pay for prescriptions dispensed during the study, and not to pay off debt accumulated because of previous charges.

The control group will continue with usual care (usually paying $5 for at least the first 20 items they or their family receive). A small number of people in the control group are likely

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to get some free prescriptions through schemes that provide one-off assistance to people who cannot afford medicines (e.g. some Primary Health Organisations provide one-off vouchers). At the end of the study period, control group participants will receive a $100 grocery voucher to acknowledge their valuable contribution to the study and to ensure that they do not feel unfairly disadvantaged by their allocation into the control group.

Outcomes

The primary outcome will be hospital bed-days. Secondary outcomes will be: all-cause hospitalisations, prescription medicines dispensed (number and type), hospitalisations for type 2 diabetes/mental health problems, deaths, and emergency department visits. We will include all publicly-funded hospital and emergency department data. These will all be accessed through data collections held by the Ministry of Health. Permission to access the data will be requested when we recruit people into the study. Further detail about data access and storage is available from the AZCTR trial registry or from the study authors.

A health economic analysis will be conducted to assess changes in self-reported quality of life, as well as costs associated with hospitalisations. We will administer the EQ-5D-5L questionnaire for each participant at baseline, at 6 months, and at the end of the intervention to calculate quality-adjusted life-years (QALYs). We will use the New Zealand scoring algorithm to assign health state utility values to the EQ-5D-5L health vectors as per national Pharmaceutical Management Agency (PHARMAC, the government body responsible for funding medicines) recommendations.

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We will also do a qualitative sub-study of a small number of participants in the intervention group, to record and explore their experiences, and the impact of the intervention on their daily lives and expenditure. Data will be collected using in-depth phone interviews with participants who were either selected randomly or were identified at recruitment as good candidates for the qualitative sub-study based on their health and living situation.

Study duration

The intervention will last 12 months, from 1 February 2019 to 31 January 2020. This timeframe has been chosen because it aligns with the government's own prescription calendar year: all New Zealanders must pay prescription charges from the 1st February each year until they have paid for 20 prescriptions, after which they no longer have to pay the charges, i.e., the prescription count "resets" on the 1st February. Previous studies have found that impacts of co-payments are quickly evident. Tamblyn et al. (2001) found significantly increased adverse events including hospitalisations in a 10 month period following an increase in co-payments in Canada [11]. Previous studies have found that non-adherence to diabetes medication is associated with significantly increased hospitalisations [27-29]. These studies measured adherence using a medication possession ratio calculated over one year, and hospitalisations in the subsequent year, suggesting that the impact is relatively rapid. Lau and Nau (2004) [29] did not include people taking insulin, where presumably the effect may be even stronger and quicker.

Sample size

Data from the NZ Atlas of Healthcare Variation suggest that on average people with diabetes in our study regions spend 1.61 days per year in hospital [30]. This is likely to

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underestimate the number of bed-days for people with type 2 diabetes in our study population, who live in areas of high deprivation and are therefore likely to have more co-morbidities and have less well-managed diabetes than average, leading to high hospitalisation rates. People taking anti-psychotics have high incidence of hospitalisation (our unpublished analyses suggest that 38% of people taking antipsychotics were hospitalised in a year) and hospitalisations for mental health tend to be long, with an average stay of 17.4 days [31]. Therefore, the number of bed-days per person for people living in highly deprived areas and taking antipsychotics is unlikely to be lower than the figure for people with diabetes. Assuming the rate of 1.61 bed-days per person, a sample size of 943 in each group would give us 80% power to detect a 10% reduction in bed-days in the intervention group. We aim to recruit 1000 people in each group to allow for people who choose to withdraw from the study.

Randomisation (sequence generation and type)

People who consent to participate will be randomly allocated to the intervention or control group at recruitment in a ratio of 1:1, with no blocking or stratification on geographical location, and with the allocation sequence concealed from the recruiter and from EQ-5D interviewers (at 6-month and 12-month interviews).

Statistical methods

The study population will be described and baseline characteristics of the two groups will be compared using descriptive statistical techniques. The primary outcome and each of the other outcomes measured as counts will be assessed using a suitable version of regression model in the Poisson family to compare rates between two groups during the follow-up

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period (with 95% confidence intervals) whilst allowing for control of any unbalanced baseline characteristics. We will follow an intention-to-treat analysis, i.e. all participants will be analysed in their allocated groups regardless of whether their prescription charges were paid for by the study or by other sources.

We will perform a cost-effectiveness analysis with the incremental cost per QALY calculated from the health systems perspective. The time horizon for the economic analysis will be for the duration of the trial and modelled out for 10 years. Participants who are not contactable, unable or unwilling to complete the EQ-5D questionnaire at all three timepoints (baseline, 6 months, 12 months) will be excluded from the QALY analyses. Qualitative data from in-depth interviews will be analysed thematically.

Discussion

Access to medicines is a human right, and poor access is likely to be bad for people's health, and may increase costs to the health system. Being unable to afford prescription medicines is only one of many factors that influence adherence to medicines. Many of these, such as patient concerns about medicines, are complex and multifactorial [32].

Conversely, prescription charges can be changed or removed relatively simply, and in New Zealand they are low and so could be removed at modest cost. The strength of an RCT is that it isolates one factor, changes this for the intervention group, but not for the control group, and measures the impact. Thus we modelled the intervention on what is likely to happen if the government, local health authorities or others chose to exempt people with low incomes and/or high health needs from prescription charges.

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It is possible that covering the $5 prescription charge may be insufficient to improve the health outcomes and reduce the burden on the health system of these particularly vulnerable population groups. Many patients incur additional costs when collecting prescriptions, such as for blister packing and for medicines that are not fully subsidised. We did not cover these additional charges in our trial because it was unlikely that these additional costs would be covered by a policy change to address prescription charges: blister packing charges are set by individual pharmacies and medicine subsidies are determined by PHARMAC, the government's medicines funding agency.

Over the past few decades in many countries, prescription co-payments have increased and the direct cost of prescription medicines has shifted from the health system or insurer to the individual. This occurred in New Zealand when the co-payment increased from $3 to $5 in 2013. However, the shift of the cost burden away from the health provider/insurer is only an advantage to the health system if it does not lead to increases in costs of providing other services. Our hypothesis is that the cost of fully covering prescription charges for poor, chronically unhealthy individuals pales in comparison to the costs associated with their subsequent decrease in health status resulting from their inability to pay for medicines. The perceived health 'savings' do not consider the health system as a whole.

No other studies have used an RCT design to investigate and measure the extent of the impact of removing prescription charges for those with low socio-economic status and high health needs. Thus, the findings from this study will inform current and future governments in NZ and elsewhere. By using a multi-faceted analytical approach, we will generate sound

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scientific evidence to determine the impact of exempting these groups from prescription charges on individuals' health and well-being outcomes, health services utilisation, and costs to the health system.

ETHICS AND DISSEMINATION

Ethics approval and consent to participate

Ethics approval for this study was granted by the Central Health and Disability Ethics Committee of New Zealand in July 2019 (19/CEN/33).

All potential participants will be given an information sheet describing what the study is about and what is involved if they choose to participate, and written consent will be required in order for them to take part (these are available on request). Members of the research team will be available to answer questions about the study at the time of recruitment and all participants will be given the research team's free-phone number and email address, should they have any questions during the study.

Safety considerations

Unlike most RCTs, we do not expect the intervention used in this study to be associated with unforeseeable negative side effects, though participants will be encouraged to speak to their health providers if they plan to re-start taking medicines because of the study. For this reason, there will not be a data monitoring team and interim analyses will not be conducted during the intervention period.

Dissemination of study findings

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The study findings will be presented at local and international conferences and submitted for publication in relevant peer-reviewed academic journals. In addition, we will consult with local health providers and community organisations to determine the most appropriate and effective way of sharing the findings in the wider community in each study area. We also plan to approach news media outlets (both local and national) to disseminate the study findings more widely to the general public, following peer review and publication in academic journals. A final report of the study findings will be disseminated to local health boards, pharmacy organisations and other relevant stakeholders and policy makers.

ADDITIONAL INFORMATION

Funding

The study is funded by the Health Research Council of New Zealand (HRC ref. 18/134). The cost of the prescription charges for the study is co-funded by the Pharmaceutical Management Agency (PHARMAC), the New Zealand Crown-owned entity that determines which medicines will be funded in New Zealand.

Author contributions

PN is the principal investigator of the study. PN and KC drafted the study protocol, with input from all authors. All authors contributed to the study design. ASamaranayaka is the biostatistician on the study and assisted with overall design and sample size calculations. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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You can take part if:
You are 18 years and older
AND
You live in certain parts of Dunedin, Porirua City or Tairāwhiti that are part of the study
AND
You are taking medicine for Type 2 diabetes or an anti-psychotic medicine (or both)

If you consent:
We will ask you about basic information like your name, address and contact details, but NOT your health history
AND
We will get your permission to look up your NHI number so that in 2020 we can find out health services used by Group A and Group B
AND
You will be put in Group A or Group B

There are 2 groups in the study:
You will not know which group you will be in
A phone app decides which group you will be in
It is random

Group A:
We take your photo and make you an ID card

1st February 2019
You don't have to pay the $5 prescription charge until 1 Feb 2020

Around February and July 2019, and January 2020
We phone you and interview you about your current health (about 10 minutes)

1 February 2020
Start paying for medicines again (as usual)

Group B:

1st February 2019
Keep paying prescription charges as usual

Around February and July 2019, and January 2020
We phone you and interview you about your current health (about 10 minutes)

February 2020
You receive a $100 grocery voucher

2020
Using NHI numbers, we will ask the Ministry of Health for information about how many hospital visits, medicines, ambulances are used by people from Group A and Group B

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Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

		Reporting Item	Page Number
Administrative information			
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
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	N/A
Protocol version	#3	Date and version identifier	3
Funding	#4	Sources and types of financial, material, and other support	18
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1, 18, 19
Roles and responsibilities: sponsor contact information	#5b	Name and contact information for the trial sponsor	18
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	18

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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)	N/A
Introduction			
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	3-6
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	3-6
Objectives	#7	Specific objectives or hypotheses	6
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)	7, 14
Methods: Participants, interventions, and outcomes			
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	10
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)	9-10
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	11-12

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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)	17
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	11
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	11-12
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	12-13, 15
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)	7-8, 13
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	14
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	9
Methods: Assignment of interventions (for controlled trials)			
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	14

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		that is unavailable to those who enrol participants or assign interventions	
Allocation concealment mechanism	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	14
Allocation: implementation	#16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	14
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	14
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
Methods: Data collection, management, and analysis			
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	12-13
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	14
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).	12

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		Reference to where details of data management procedures can be found, if not in the protocol	
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	14
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	14
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 imputation)	14
Methods: Monitoring			
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	17-18
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	17-18
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	17-18
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
Ethics and dissemination			

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Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	17
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)	3
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	17
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	17
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	12
Declaration of interests	#28	Financial and other competing interests for principal investigators for the overall trial and each study site	19
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	12
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	18
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	N/A
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	12

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Appendices

Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	17
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

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BMJ Open

Impact of removing prescription charges on health outcomes: protocol for a randomised controlled trial

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Title

Impact of removing prescription charges on health outcomes: protocol for a randomised controlled trial

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ABSTRACT

Introduction. Prescription charges prevent many people from accessing the medicines they need to maintain or improve their health. In New Zealand, where most people pay $5 per prescription item, Māori and Pacific peoples, those living in most deprived areas and those with chronic health conditions are the most likely to report that cost prevents them from accessing medicines.

Methods and analysis. This randomised controlled trial will evaluate the effect of removing prescription charges on health outcomes and health care utilisation patterns of people with low income and high health needs. We will enrol 2,000 participants: half will be allocated to the intervention group and we will pay for their prescription charges for 12 months. The other half will receive usual care. The primary outcome will be hospital bed-days. Secondary outcomes will be: all-cause and diabetes/mental health-specific hospitalisations, prescription medicines dispensed (number and type), deaths, emergency department visits, and quality of life as measured by EQ-5D-5L. Costs associated with these outcomes will be compared in an economic sub-study. A qualitative sub-study will also help understand the impact of free prescriptions on participant well-being, using in-depth interviews.

Discussion. Being unable to afford prescription medicines is only one of many factors that influence adherence to medicines, but removing prescription charges is relatively simple and in New Zealand would be cheap compared to other policy changes. This RCT will help identify the extent of the impact of a simple intervention to improve access to medicines on health outcomes and health service utilisation.

Ethics and Dissemination. This study was approved by the Central Health and Disability Ethics Committee (NZ) in July 2019 (19/CEN/33). Findings will be reported in peer-reviewed

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publications, as well as in professional newsletters, mainstream media and through public meetings.

Trial Registration. Australian New Zealand Clinical Trials Registry (ANZCTR): ACTRN12618001486213p.

Protocol v1 (4 September 2018). All updates registered with ANZCTR.

ARTICLE SUMMARY

Strengths and limitations of this study

- This RCT is the first to test the effect of eliminating prescription charges on health outcomes, in isolation from other interventions
- The study targets people who are most likely to experience financial barriers to accessing medicines, including indigenous and ethnic minority populations
- Unfortunately, there is no centralised method for implementing the intervention, so it relies on pharmacists to provide the intervention
- Primary care data are not consistently recorded on a national level, so outcomes such as primary care visits cannot be included.

INTRODUCTION

Background

While the majority of middle and high-income countries are able to provide their populations with high-quality health services, not all social groups benefit equally from the services offered. Poorer access to health care and negative experiences in the healthcare system can lead to adverse outcomes for some people [1] and addressing inequalities in health outcomes remains a key issue for many governments.

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In New Zealand, Māori (the country's indigenous population), Pacific people and other minority groups experience barriers to accessing prescription medicines and other care. It has been estimated that if Māori were to receive prescription medicines at the same rate as non-Māori, non-Pacific people with similar burden of disease, Māori would get over one million more prescriptions per year, equivalent to a 41% shortfall in medicines that should have been dispensed [2]. Less is known about rates of medicine use by Pacific people, but almost a fifth of Pacific adults report prescription charges prevent them from accessing medicines [3]. There are likely to be many complex reasons for this, which are difficult to address, but there is also a simple, policy-amenable barrier: prescription charges [4].

As in other high-income countries, the design of the prescription charges regime in New Zealand and the level of charges have changed multiple times since they were introduced in the 1980s. A brief overview of current prescription charges in New Zealand is presented in Box 1. Despite the numerous changes, there is little evidence to inform future policy changes. There are strong arguments for keeping prescription charges for the majority of the population, such as reducing waste, encouraging people to value medicines, and offsetting the cost of medicines. However, there are also strong arguments that, for some people, prescription charges may lead to significant worsening of health and increased use of other, more expensive services, such as publicly-funded inpatient hospital care.

Current prescription charge regime in New Zealand

Medicines Cost: New Zealanders pay a variety of charges for their medicines, which cover all or part of the cost of the medicine, dispensing fees and additional fees such as for blister packing. Some medicines are unsubsidised, so patients pay the whole cost plus a dispensing fee; others are partially subsidised so people pay a part-charge and a dispensing fee. However, most people pay only a standard $5 "prescription charge" (or co-payment) for each prescription item, regardless of the actual cost of the medicine.

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Exemptions: There are very few exemptions for the prescription charges. Children under 14 years old are exempted and there are no exemptions based on low income. Some pharmacies absorb the $5 charge to attract customers (for the pharmacy or supermarket in which they are located). Individuals or families are exempt from prescription charges after they pay for 20 items in one calendar year but there is evidence that most people do not know about this exemption and some continue to be charged the co-payment [5 6]. Repeat prescriptions usually do not incur $5 prescription charge.

Box 1. Description of the current prescription charges regime in New Zealand.

Numerous studies have shown that increasing the amount people pay for prescriptions leads to decreased use of prescription medicines [7-9]. Furthermore, amongst some patient groups, increased prescription charges lead to poorer health status [10] and higher use of other healthcare [7 11 12], although the quality of evidence is generally low [9]. Previous research by the authors and others in New Zealand has shown that people report that prescription charges prevent them picking up medicines [13 14]. Analysis of SOFIE (Statistics New Zealand's Survey of Family, Income and Employment) data suggests that inability to afford prescription medicines is associated with a decline in self-reported health status [15]. In many countries, such as England and Australia, people on low incomes or those with chronic conditions pay less than the general population for their prescriptions. While these policies seem to acknowledge that cost is a barrier to accessing medicines for certain groups of people, very few studies have explicitly tested this hypothesis.

Although $5 per prescription item is low by international standards [16 17], there are no exemptions for people on low incomes and New Zealanders usually also pay for primary care consultations (usually NZ$15-NZ$50 [18]); thus prescription charges are an additional barrier to primary healthcare. As New Zealand has a high level of income inequality and poverty [19 20], there are many people on very low incomes for whom prescription charges can be a barrier to accessing medicines. In the latest NZ Health Survey, 5.1% of the adult

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population, including 12.7% of Māori and 14% of Pacific peoples, reported not picking up at least one medicine in the last 12 months because of cost. Those who lived in the most deprived areas were more than six times as likely to report this as those in the least deprived areas [3]. The aim of this study is therefore to determine whether removing this barrier (i.e., the standard $5 prescription charge) leads to decreased use of hospital and other services by people living in areas of high deprivation and with high health needs.

The study will evaluate the effect of removing prescription charges on the usage of publicly-funded healthcare services on people with low income and high health needs. It will compare the health outcomes and health care utilisation patterns of those who pay standard prescription charges with those who receive free prescriptions. Such an experimental study has not been done in New Zealand (and very seldom done overseas). If the study shows that removing prescription charges for some groups of people was beneficial, it would be feasible and relatively straightforward to introduce and implement a policy change in New Zealand.

METHODS AND ANALYSIS

The SPIRIT reporting guidelines were used in the development of this study protocol[21]. The checklist is available as a supplementary file.

Trial design

The study will employ two-group parallel randomised controlled trial design across three geographical areas, with participants equally randomised to having their prescription charges paid for a year or usual care. Upon recruitment into the study, participants will complete an interviewer-administered questionnaire covering demographics, health status

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(including EQ-5D) and health service use so that the study population can be described and the success of randomisation assessed. Following the 12-month intervention period, hospital bed-days and other secondary outcomes for the groups will be compared between the intervention and control groups.

A diagram depicting the recruitment and data collection process, as provided to participants in the study information sheet, is shown in Figure 1. The SPIRIT diagram is presented in Table 1.

[Insert Figure 1 here.]

Figure 1. Diagram of inclusion, recruitment and procedure, as provided to all potential participants.

Table 1. SPIRIT diagram for RCT of prescription payment charges: schedule of enrolment, interventions and assessments.

	STUDY PERIOD					
	Enrolment	**Allocation**	**Post-allocation**			**Close-out**
TIMEPOINT	***Oct-Dec 2018 -t_1***	**Oct-Dec 2018 0**	***Feb 2019 t_1***	***Jul 2019 t_2***	***Jan 2020 t_3***	***Feb-Mar 2020 T_4***
ENROLMENT:						
Eligibility screen	X					
Informed consent	X					
ID card (intervention group)		X				
Allocation		X				
INTERVENTIONS:						

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Prescription payments			↔	↔	↔	
Usual care			↔	↔	↔	
ASSESSMENTS:						
EQ-5D	X	X		X	X	
Hospital bed-days; hospitalisations				X	X	X
Dispensing data, other health services use data			X	X	X	X

Patient and public involvement statement

Prior to undertaking this study, previous qualitative research by PN highlighted the financial barriers many people faced when getting their medicines. A feasibility study was then conducted which aimed to determine the most relevant and appropriate study areas, participant inclusion/exclusion criteria, participant recruitment strategies, and prescription payment methods. During the feasibility study, focus groups were conducted with people who resembled our future participants in terms of age, ethnicity, and health and social conditions, in order to gain insight into the most acceptable and effective methods of recruiting participants and paying for their medicines. At the beginning of the study, a focus group of people similar to our study participants provided valuable feedback on the participant information sheet in order to make it clearer and easier to understand. Health providers, pharmacists and local community organisations were also consulted during the feasibility study and prior to the beginning of participant recruitment. They are also involved in contacting potential participants and in providing space for recruitment events.

At the end of the study, we will consult local health providers and community organisations again in order to make sure that we disseminate the study findings to participants and their communities in a way that is both culturally appropriate and effective.

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Participants

The study population will be people living in the most deprived areas who have either type 2 diabetes, for which they take medication, or on-going mental health problems, for which they take anti-psychotics. This population has been chosen because individuals are at high risk of not being able to afford their medicines, i.e., they are likely to require large numbers of medicines and to have low incomes. We are aware that people with serious on-going mental health problems may stop taking their medicines for a range of reasons, one of which is inability to afford them. This study will only determine what difference prescription charges make. Potential participants will be recruited through organisations that serve and/or represent them. The feasibility study that we conducted prior to the study suggested that there are considerable advantages in recruiting people in group settings, and through organisations they know and trust.

Inclusion criteria. To be eligible for the study, participants must:

- be at least 18 years old;
- be able to communicate in English;
- have a diagnosis of type 2 diabetes with treatment requiring medication AND/OR be taking at least one anti-psychotic medication;
- reside in one of three territorial authorities: Dunedin City, Porirua City, or Tairāwhiti District; and
- have a physical address in a census area unit categorised as NZDep 8, 9, or 10. (Note: NZDep is an area-based socioeconomic deprivation score, with NZDep 8, 9, and 10 indicating the most deprivation [22].)

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Exclusion criteria. Participants will be excluded if they do not provide written consent to access pre-specified medical information using their unique person identifier for health services, the National Health Index (NHI) number [23]. Participants will not be excluded if they have other health conditions in addition to those needed to meet the study inclusion criteria.

Study settings

To ensure ethnic and rural-urban diversity and sufficient numbers of potential participants, the study will be carried out in three geographical regions: Dunedin City, Porirua City, and Tairāwhiti District. Dunedin City is a medium-sized city with a predominately New Zealand European population. Porirua City is a satellite city of the country's capital, Wellington. It has significant proportions of Māori and Pacific peoples. The Tairāwhiti District is primarily rural, with a predominantly Māori population and a small city (Gisborne). Demographic characteristics of the study sites are presented in Table 2.

Table 2. Population, ethnicity and deprivation of study areas

	Territorial Authority		
	Dunedin City	**Porirua City**	**Gisborne District**
Census usually resident population (2013)	**120,246**	**51,717**	**43,656**
Māori (%)*	8,865 (7.4)	10,131 (19.6)	19,683 (45.1)
Pacific (%)*	2,826 (2.4)	12,738 (24.6)	1,539 (3.5)
NZDep2013: 8, 9, 10 census area units	**29,862**	**25,605**	**28,191**
Maori (%)*	2,700 (9.0)	7,116 (27.8)	15,606 (55.4)
Pacific (%)*	1,113 (3.7)	11,064 (43.2)	1,311 (4.7)

*Ethnicity count based on grouped total responses
Population data retrieved from Statistics New Zealand 2014. 2013 Meshblock dataset [24].
NZDep data retrieved from University of Otago Wellington. NZDep2013 census area Unit data [25].

Intervention

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The intervention group will be exempted from $5 prescription charges for one year. Ideally, participants would be identified in a national dataset, so they were automatically exempt from payment when they received their prescription medicines. Unfortunately this is impossible so instead participants will be given a photo ID card indicating they are in the study, and pharmacies will be given lists of names and NHI numbers of participants in their geographical region. Pharmacists will be asked to tag participants in their computer systems and to keep the list for use throughout the study. We will visit pharmacies throughout the study period to ensure that the list is still accessible and usable. The Pharmacy Guild of New Zealand, which represents many community pharmacy owners, has also offered to notify its members about the study, in case study participants travel outside their region. The study's free-phone number and e-mail address will be supplied to pharmacies and participants, to contact us in case of any disputes or confusion. During the feasibility study we trialled this system in Tairāwhiti and it worked well.

We have established good relationships with pharmacies in the study areas and are confident that they will assist with the study. When prescriptions are dispensed for the study participants in the intervention group, the $5 charge will be billed to the study. Participants will need to pay for other charges such as blister packing, part-charges, and the full cost of unsubsidised medicines. This is in line with the likely policy outcome if the study finds a benefit, which is the exemption of certain population groups from the $5 charge. Participants and pharmacies will also be instructed that the study funding can only be used to pay for prescriptions dispensed during the study, and not to pay off debt accumulated because of previous charges.

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The control group will continue with usual care (usually paying $5 for at least the first 20 items they or their family receive). A small number of people in the control group are likely to get some free prescriptions through schemes that provide one-off assistance to people who cannot afford medicines (e.g. some Primary Health Organisations provide one-off vouchers). At the end of the study period, control group participants will receive a $100 grocery voucher to acknowledge their valuable contribution to the study and to ensure that they do not feel unfairly disadvantaged by their allocation into the control group.

Outcomes

The primary outcome will be hospital bed-days. Secondary outcomes will be: all-cause hospitalisations, prescription medicines dispensed (number and type), hospitalisations for type 2 diabetes/mental health problems, deaths, and emergency department visits. We will include all publicly-funded hospital and emergency department data (in New Zealand, all acute care is provided within the public system[18]). These will all be accessed through data collections held by the Ministry of Health. Permission to access the data will be requested when we recruit people into the study. Further detail about data access and storage is available from the ANZCTR trial registry or from the study authors.

A health economic analysis will be conducted to assess changes in self-reported quality of life, as well as costs associated with hospitalisations. We will administer the EQ-5D-5L questionnaire for each participant at baseline, at 6 months, and at the end of the intervention to calculate quality-adjusted life-years (QALYs). We will use the New Zealand scoring algorithm to assign health state utility values to the EQ-5D-5L health vectors as per

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national Pharmaceutical Management Agency (PHARMAC, the government body responsible for funding medicines) recommendations.

We will also do a qualitative sub-study of a small number of participants in the intervention group, to record and explore their experiences, and the impact of the intervention on their daily lives and expenditure. Data will be collected using in-depth phone interviews with participants who were either selected randomly or were identified at recruitment as good candidates for the qualitative sub-study based on their health and living situation.

Study duration

The intervention will last 12 months, from 1 February 2019 to 31 January 2020. This timeframe has been chosen because it aligns with the government's own prescription calendar year: all New Zealanders must pay prescription charges from the 1st February each year until they have paid for 20 prescriptions, after which they no longer have to pay the charges, i.e., the prescription count "resets" on the 1st February. Previous studies have found that impacts of co-payments are quickly evident. Tamblyn et al. (2001) found significantly increased adverse events including hospitalisations in a 10 month period following an increase in co-payments in Canada [11]. Previous studies have found that non-adherence to diabetes medication is associated with significantly increased hospitalisations [26-28]. These studies measured adherence using a medication possession ratio calculated over one year, and hospitalisations in the subsequent year, suggesting that the impact is relatively rapid. Lau and Nau (2004) [28] did not include people taking insulin, where presumably the effect may be even stronger and quicker.

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Sample size

Data from the NZ Atlas of Healthcare Variation suggest that on average people with diabetes in our study regions spend 1.61 days per year in hospital [29]. This is likely to underestimate the number of bed-days for people with type 2 diabetes in our study population, who live in areas of high deprivation and are therefore likely to have more co-morbidities and have less well-managed diabetes than average, leading to high hospitalisation rates. People taking anti-psychotics have high incidence of hospitalisation (our unpublished analyses suggest that 38% of people taking antipsychotics were hospitalised in a year) and hospitalisations for mental health tend to be long, with an average stay of 17.4 days [30]. Therefore, the number of bed-days per person for people living in highly deprived areas and taking antipsychotics is unlikely to be lower than the figure for people with diabetes. Assuming the rate of 1.61 bed-days per person, a sample size of 943 in each group would give us 80% power to detect a 10% reduction in bed-days in the intervention group. We aim to recruit 1000 people in each group to allow for people who choose to withdraw from the study.

Randomisation (sequence generation and type)

People who consent to participate will be randomly allocated to the intervention or control group at recruitment in a ratio of 1:1, with no blocking or stratification on geographical location, and with the allocation sequence concealed from the recruiter and from EQ-5D interviewers (at 6-month and 12-month interviews).

Statistical methods

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The study population will be described and baseline characteristics of the two groups will be compared using descriptive statistical techniques. The primary outcome and each of the other outcomes measured as counts will be assessed using a suitable version of regression model in the Poisson family to compare rates between two groups during the follow-up period (with 95% confidence intervals) whilst allowing for control of any unbalanced baseline characteristics. We will follow an intention-to-treat analysis, i.e. all participants will be analysed in their allocated groups regardless of whether their prescription charges were paid for by the study or by other sources.

We will perform a cost-effectiveness analysis with the incremental cost per QALY calculated from the health systems perspective. The time horizon for the economic analysis will be for the duration of the trial and modelled out for 10 years. Participants who are not contactable, unable or unwilling to complete the EQ-5D questionnaire at all three timepoints (baseline, 6 months, 12 months) will be excluded from the QALY analyses. Qualitative data from in-depth interviews will be analysed thematically.

Discussion

Access to medicines is a human right, and poor access is likely to be bad for people's health, and may increase costs to the health system. Being unable to afford prescription medicines is only one of many factors that influence adherence to medicines. Many of these, such as patient concerns about medicines, are complex and multifactorial [31].

Conversely, prescription charges can be changed or removed relatively simply, and in New Zealand they are low and so could be removed at modest cost. The strength of an RCT is

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that it isolates one factor, changes this for the intervention group, but not for the control group, and measures the impact. Thus we modelled the intervention on what is likely to happen if the government, local health authorities or others chose to exempt people with low incomes and/or high health needs from prescription charges.

It is possible that covering the $5 prescription charge may be insufficient to improve the health outcomes and reduce the burden on the health system of these particularly vulnerable population groups. Many patients incur additional costs when collecting prescriptions, such as for blister packing and for medicines that are not fully subsidised. We did not cover these additional charges in our trial because it was unlikely that these additional costs would be covered by a policy change to address prescription charges: blister packing charges are set by individual pharmacies and medicine subsidies are determined by PHARMAC, the government's medicines funding agency.

Over the past few decades in many countries, prescription co-payments have increased and the direct cost of prescription medicines has shifted from the health system or insurer to the individual. This occurred in New Zealand when the co-payment increased from $3 to $5 in 2013. However, the shift of the cost burden away from the health provider/insurer is only an advantage to the health system if it does not lead to increases in costs of providing other services. Our hypothesis is that the cost of fully covering prescription charges for poor, chronically unhealthy individuals pales in comparison to the costs associated with their subsequent decrease in health status resulting from their inability to pay for medicines. The perceived health 'savings' do not consider the health system as a whole.

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No other studies have used an RCT design to investigate and measure the extent of the impact of removing prescription charges for those with low socio-economic status and high health needs. Thus, the findings from this study will inform current and future governments in NZ and elsewhere. By using a multi-faceted analytical approach, we will generate sound scientific evidence to determine the impact of exempting these groups from prescription charges on individuals' health and well-being outcomes, health services utilisation, and costs to the health system.

ETHICS AND DISSEMINATION

Ethics approval and consent to participate

Ethics approval for this study was granted by the Central Health and Disability Ethics Committee of New Zealand in July 2019 (19/CEN/33).

All potential participants will be given an information sheet describing what the study is about and what is involved if they choose to participate, and written consent will be required in order for them to take part (these are available on request). Members of the research team will be available to answer questions about the study at the time of recruitment and all participants will be given the research team's free-phone number and email address, should they have any questions during the study.

Safety considerations

Unlike most RCTs, we do not expect the intervention used in this study to be associated with unforeseeable negative side effects, though participants will be encouraged to speak to their health providers if they plan to re-start taking medicines because of the study. For this

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reason, there will not be a data monitoring team and interim analyses will not be conducted during the intervention period.

Dissemination of study findings

The study findings will be presented at local and international conferences and submitted for publication in relevant peer-reviewed academic journals. In addition, we will consult with local health providers and community organisations to determine the most appropriate and effective way of sharing the findings in the wider community in each study area. We also plan to approach news media outlets (both local and national) to disseminate the study findings more widely to the general public, following peer review and publication in academic journals. A final report of the study findings will be disseminated to local health boards, pharmacy organisations and other relevant stakeholders and policy makers.

ADDITIONAL INFORMATION

Funding

The study is funded by the Health Research Council of New Zealand (HRC ref. 18/134). The cost of the prescription charges for the study is co-funded by the Pharmaceutical Management Agency (PHARMAC), the New Zealand Crown-owned entity that determines which medicines will be funded in New Zealand.

Author contributions

PN is the principal investigator and conceived of the study. A feasibility study was carried out by PN, KC, SK, ASmith, SH. PN and KC designed the study and drafted the study protocol, with input from ASmith, ASamaranayaka, CM, SK, SH, MC. ASamaranayaka is the

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biostatistician on the study and assisted with overall design and sample size calculations. CM provided detail for the health economic aspects of the study. SH and ASmith provided detail for the health outcomes data. MC and SK provided study site-specific advice on participant recruitment and Māori and Pacific input into the study. All authors read and approved the final manuscript. All authors meet the four ICMJE criteria for authorship.

Competing interests

The authors declare that they have no competing interests.

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You can take part if:
You are 18 years and older
AND
You live in certain parts of Dunedin, Porirua City or Tairāwhiti that are part of the study
AND
You are taking medicine for Type 2 diabetes or an anti-psychotic medicine (or both)

If you consent:
We will ask you about basic information like your name, address and contact details, but NOT your health history
AND
We will get your permission to look up your NHI number so that in 2020 we can find out health services used by Group A and Group B
AND
You will be put in Group A or Group B

There are 2 groups in the study:
You will not know which group you will be in
A phone app decides which group you will be in
It is random

Group A:
We take your photo and make you an ID card

1st February 2019
You don't have to pay the $5 prescription charge until 1 Feb 2020

Around February and July 2019, and January 2020
We phone you and interview you about your current health (about 10 minutes)

1 February 2020
Start paying for medicines again (as usual)

Group B:

1st February 2019
Keep paying prescription charges as usual

Around February and July 2019, and January 2020
We phone you and interview you about your current health (about 10 minutes)

February 2020
You receive a $100 grocery voucher

2020
Using NHI numbers, we will ask the Ministry of Health for information about how many hospital visits, medicines, ambulances are used by people from Group A and Group B

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Reporting checklist for protocol of a clinical trial.

Based on the SPIRIT guidelines.

		Reporting Item	Page Number
Administrative information			
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
Trial registration: data set	#2b	All items from the World Health Organization Trial Registration Data Set	N/A
Protocol version	#3	Date and version identifier	3
Funding	#4	Sources and types of financial, material, and other support	18
Roles and responsibilities: contributorship	#5a	Names, affiliations, and roles of protocol contributors	1, 18, 19
Roles and responsibilities: sponsor contact information	#5b	Name and contact information for the trial sponsor	18
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	18

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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)	N/A
Introduction			
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	3-6
Background and rationale: choice of comparators	#6b	Explanation for choice of comparators	3-6
Objectives	#7	Specific objectives or hypotheses	6
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)	7, 14
Methods: Participants, interventions, and outcomes			
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	10
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)	9-10
Interventions: description	#11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	11-12

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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)	17
Interventions: adherance	#11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return; laboratory tests)	11
Interventions: concomitant care	#11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	11-12
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	12-13, 15
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)	7-8, 13
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	14
Recruitment	#15	Strategies for achieving adequate participant enrolment to reach target sample size	9
Methods: Assignment of interventions (for controlled trials)			
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	14

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		that is unavailable to those who enrol participants or assign interventions	
Allocation concealment mechanism	#16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	14
Allocation: implementation	#16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	14
Blinding (masking)	#17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	14
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
Methods: Data collection, management, and analysis			
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	12-13
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	14
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).	12

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		Reference to where details of data management procedures can be found, if not in the protocol	
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	14
Statistics: additional analyses	#20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	14
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 imputation)	14
Methods: Monitoring			
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	17-18
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	17-18
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	17-18
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
Ethics and dissemination			

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Research ethics approval	#24	Plans for seeking research ethics committee / institutional review board (REC / IRB) approval	17
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)	3
Consent or assent	#26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	17
Consent or assent: ancillary studies	#26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	17
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	12
Declaration of interests	#28	Financial and other competing interests for principal investigators for the overall trial and each study site	19
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	12
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	18
Dissemination policy: authorship	#31b	Authorship eligibility guidelines and any intended use of professional writers	N/A
Dissemination policy: reproducible research	#31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	12

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Appendices

Informed consent materials	#32	Model consent form and other related documentation given to participants and authorised surrogates	17
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

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