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# Behavioral economic insights to improve medication adherence in adults with chronic conditions: a scoping review protocol

## Introduction

Medication non-adherence has been identified as a major barrier to effectively managing chronic conditions.<sup>1</sup> The consequences of non-adherence include poorer outcomes for patients,<sup>2</sup> higher rates of hospitalisation<sup>3,4</sup> and increased mortality,<sup>5</sup> even for patients only taking placebos.<sup>6</sup> This increase in morbidity and mortality due to non-adherence places an additional financial burden on healthcare systems.<sup>7</sup>

Nonadherence may exist at different stages of the treatment continuum. Patients may not initiate treatment by failing to fill their prescription; they may fail to implement the correct dose by either missing doses or taking more or less than the prescribed dose; or they may discontinue treatment early.<sup>8</sup> Non-adherence behavior can be intentional or unintentional.<sup>9,10</sup> Intentional non-adherence involves an active decision by the patient to either alter doses or not take the medication at all whereas unintentional non-adherence includes more passive actions such as forgetfulness or the inability to follow instructions due to cognitive or physical limitations.<sup>9,10</sup> Patients can exhibit both intentional and unintentional behaviors simultaneously.<sup>11</sup>

Rates of primary non-adherence, defined as the failure to initiate treatment, is estimated at between 6% and 35%.<sup>12-19</sup> This means that up to one third of patients do not fill their first prescription. Primary reasons for lack of initiation include perceptions around need, affordability and concerns about the risks and benefits of medication.<sup>20</sup> Even if patients fill their first prescription, a Canadian study found that between 6 and 14% of patients taking statins fail to fill their second prescription.<sup>21</sup> Within one year, approximately 50% of patients prescribed antihypertensive therapy were non-adherent<sup>22</sup> and by 24 months 43% of patients with cardiovascular disease were non-adherent.<sup>23</sup>

A number of reviews have investigated barriers to medication adherence including at the patient, provider, and health system levels.<sup>24-29</sup> In addition, there exists extensive review literature on interventions to improve medication adherence in general,<sup>30-32</sup> for specific diseases or risk factors, such as hypertension,<sup>33-37</sup> diabetes,<sup>38-41</sup> and cardiovascular disease<sup>42-46</sup> and for specific target groups, such as older adults,<sup>47-49</sup> patients with adherence problems<sup>50</sup> and underrepresented adults.<sup>51,52</sup> A systematic review in 2013 on the cost-effectiveness of medication adherence interventions was only able to identify 14 eligible studies.<sup>53</sup> The findings from these studies were mixed, with only four studies showing incremental cost-effectiveness ratios below stated willingness-to-pay thresholds. The authors also found that the reason many of the studies were unable to show cost-effectiveness, was that the interventions themselves were ineffective at improving medication adherence.

A potentially cost-effective addition to medication adherence interventions could come from behavioral economic insights. Whereas neoclassical economics assumes that individuals are rational and make decisions based on consistent preferences and sufficient information, behavioral

economics identifies a number of systematic cognitive biases that influence individual decision making and behaviours.<sup>54</sup> One such bias, present-bias, disproportionately weights present costs and benefits relative to future costs and benefits.<sup>55</sup> This can be illustrated in patients with asymptomatic disorders, such as hypertension, requiring long-term adherence to medication. The financial costs and the inconvenience of taking medication is in the present and is weighted more than the potential benefits of the medication, which are often far in the future.<sup>54</sup> Interventions using financial incentives to offset the immediate costs of inconvenient or onerous behaviors have been used to increase physical activity<sup>56-60</sup> and improve medication adherence.<sup>61,62</sup> One study aimed to increase physical activity by offering financial incentives through a lottery system.<sup>60</sup> The financial incentives offset the immediate costs of exercising, and the lottery system takes advantage of another behavioral economic concept, prospect theory, to improve the impact of the financial incentives. Prospect theory states that people tend to overweight small probabilities when deciding between alternative options that involve uncertainty and risk.<sup>63</sup> Another bias associated with prospect theory, loss aversion, describes the concept where individuals experience greater pain when losing something, than pleasure from gaining the same thing.<sup>64</sup> Recognition of this bias has been used in interventions to increase weight loss, at least in the short-term.<sup>59,65</sup> One study included a deposit contract as one of the three weight loss plans being tested.<sup>65</sup> The deposit contract required participants to invest their own money, which was forfeited if they failed to meet their weight loss goals.

Many of the therapies for managing chronic diseases are highly effective. For these therapies to achieve their potential impact, especially as the population ages and the prevalence of chronic disease increases, exploring new ways to influence patient behavior is needed.<sup>66,67</sup> Approaches using insights from behavioral economics may provide new opportunities to improve medication adherence, thereby reducing the burden, both in terms of morbidity and mortality and additional healthcare costs, of unmanaged chronic diseases. A scoping review on the use of behavioral economic interventions for the prevention and treatment of type II diabetes found 15 studies that used one of three types of behavioral economic interventions – financial incentives, choice architecture adjustments and commitments devices.<sup>68</sup> The authors concluded that these studies showed some potential for improving patient behaviors in relation to diabetes. A broader perspective will be taken in this study, including additional behavioral economic concepts and a wider range of chronic conditions requiring long-term medication adherence. The objective of this review therefore is to map the available evidence to provide an overview of the use of behavioral economic insights to improve medication adherence in adults with chronic conditions in a high income setting.

A preliminary search was conducted in August 2018 for scoping and systematic reviews on this topic in the following databases: JBI Database of Systematic Reviews and Implementation Reports, Cochrane Database of Systematic Reviews, PubMed, Epistemonikos and The Cumulative Index to Nursing and Allied Health Literature (CINAHL). No similar studies were found.

### **Review questions**

The following are our four research questions, which will be used to inform the development of an intervention in a high-income setting:

1. Which behavioral economic insights have been investigated to improve medication adherence for adult patients with chronic conditions?
2. Which patient populations, outcomes and diseases have been studied?
3. Which research methods have been used in the studies on this subject?
4. How effective are interventions that draw on behavioral economic insights in improving medication adherence for adult patients with chronic conditions?

**Keywords: behavioral economics; chronic conditions; medication adherence.**

### **Inclusion criteria**

As a scoping review takes a broader view of an issue, the Population, Concept and Context (PCC) framework has been used.<sup>69</sup>

#### *Population*

All adults taking medication for the treatment of a chronic condition will be included in this scoping review. Studies in hospitals, prisons, aged-care homes and other facilities where medication is administered to patients will be excluded. Chronic conditions will include both diseases and risk factors requiring long-term medication adherence, including cardiovascular diseases, hypertension, type II diabetes mellitus, HIV and chronic kidney disease. Mental health conditions will also be included.

#### *Concept*

All interventions relevant to high income settings using insights from behavioral economics to improve medication adherence in adults will be included, such as interventions to address decision errors relating to present-bias, prospect theory (poor understanding of probabilities), loss aversion and social influences/norms. All study designs published in English, including experimental, quasi-experimental and non-experimental studies will be included. No limits will be placed on the source of evidence as this approach will lead to greater sensitivity in the search, which is preferred for scoping reviews.<sup>70</sup>

#### *Context*

All relevant high income contexts will be considered for inclusion. These may include but not limited to primary health care (general practice facilities, community clinics, pharmacies), companies with corporate wellness programs and health insurance schemes.

#### *Types of studies*

As this is a scoping review, all study types including observational studies, pilot studies and randomized trials will be included. Opinion papers and letters will be excluded.

## **Methods**

### **Study design**

A scoping review will be undertaken for this study to provide a synthesis of the current available evidence on the use of interventions that draw on insights from behavioral economics to improve

medication adherence in adults with chronic conditions. The purpose of scoping reviews is to provide a broad overview of a particular area of interest, identifying the key concepts, research gaps and summarizing and disseminating research findings.<sup>71</sup> As this study aims to describe a broad range of patients, diseases, research methodologies and behavioral economic interventions to improve medication adherence for chronic conditions, a scoping review is an appropriate methodology.<sup>69</sup> The Joanna Briggs Institute of Reviewers' Manual will be used to conduct this study.<sup>70</sup> As the development of the PRISMA statement for scoping reviews (PRISMA-ScR) is still underway, the PRISMA statement for reporting health care interventions will be used.<sup>72,73</sup>

### **Information sources and search strategy**

The research team includes a general practice expert (NS) who provided advice on the chronic conditions to be included. Thereafter, a three-step search strategy was undertaken.<sup>74</sup> After an initial search of two databases, the text words and index terms of relevant articles were identified and included in the final search strategy. This search strategy was peer reviewed by an information specialist using the Peer Review of Electronic Search Strategies (PRESS) checklist.<sup>75</sup> The following databases will be searched for citations published in English: PubMed, EMBASE, SCOPUS, PsycINFO, EconLit and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) from database inception to present. Grey literature will be searched using Google Scholar, Open-Grey ([www.opengrey.eu](http://www.opengrey.eu)) and the Grey Literature Report ([www.greylit.org](http://www.greylit.org)). Forward and backward citation searching of relevant articles will be done. No time limit will be placed on the search strategy. The final search strategy for PubMed is presented in Appendix I. Search strategies for the other databases used are available from the corresponding author.

### **Study selection process**

The citations will be imported into Endnote V8.2 (Clarivate Analytics, PA, USA), where duplicates will be removed. Duplicates not detected by EndNote will be removed manually. The remaining citations will be imported into Rayyan.<sup>76</sup> As many of the behavioral economic terms have multiple uses in other research areas and a large number of results is expected, one reviewer will review titles only. Thereafter, two reviewers will independently review abstracts using a questionnaire with inclusion criteria to identify eligible studies. The full-text articles will be reviewed by two reviewers for articles where the title and abstract contain insufficient information to determine eligibility. If the full-text article is still unclear on the study eligibility criteria, study authors will be contacted for further information. Where disagreements exist among reviewers, the article will be discussed between the two reviewers to reach consensus. If there is continued disagreement, a third reviewer will be requested to make a final decision. The reasons for excluding studies at the full-text level will be recorded and reported in the review.

### **Data extraction**

One reviewer will extract data on study characteristics, study design and study outcomes using Microsoft Excel (2013). The extraction form will be trialed on a sample of five studies to ensure all relevant details are captured. Study characteristics will include authorship, year study was conducted, year and journal of publication, funding source, geographical region and type of article. Study design

will include type of study, aim of the study, type of behavioral economic insight used, intervention, comparator, study population, sample size, patient care setting, patient characteristics, disease, type of medication, duration of the intervention, follow-up period and statistical methods used. Study outcomes will include how medication adherence was measured, and the key findings of the study. A second reviewer will validate 25% of the extracted information. Any disagreements will be resolved through discussion until consensus is reached.

### **Methodological quality appraisal**

Methodological quality assessment and risk of bias will not be undertaken for this study, which is consistent with scoping review guidance.<sup>69</sup>

### **Data synthesis**

The results of the data extraction will be presented in a table that outlines the first author, geographical location, year of publication, study population, study design, type(s) of interventions, comparator(s), participant characteristics (average age, race, ethnicity and gender) and characteristics of the intervention (strategy, details of the intervention, duration and primary outcomes). Descriptive statistics will be used to provide a summary of the characteristics of the studies, including the year of publication, geographical locations, funding sources, duration of the study, disease and setting of the study. These categorical data will be summarized using percentages and frequencies. A narrative summary of the studies will be prepared considering the nature of the intervention, the population, study design features and the study results. In addition, the narrative summary will also consider the nature of the disease area targeted, i.e. is the condition a physical or a mental condition, is the disease symptomatic or asymptomatic and the proximity or risk of adverse consequences.

### **Ethics and dissemination**

As this scoping review uses data available in the public domain, no ethics application is required. The results from this study will be disseminated at conferences and published in a peer-reviewed journal.

## **Contributors**

JR conceived and designed the study and drafted the protocol. JK, GH & NS helped to design the study and edit the protocol. All authors read and approved the final protocol prior to its submission.

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Not applicable

## **Conflict of interest**

The authors declare no conflict of interest

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## Appendix I

	TERM	SEARCH TERMS
1	Adherence	"Medication Adherence"[Mesh] OR (adherence[Title/Abstract] OR complian*[Title/Abstract] OR nonadherence[Title/Abstract] OR non-adherence [Title/Abstract] OR adherent[Title/Abstract] OR non-adherent[Title/Abstract] OR nonadherent[Title/Abstract] OR non-complian*[Title/Abstract] OR noncomplian*[Title/Abstract] OR concordan*[Title/Abstract] OR nonconcordan*[Title/Abstract] OR persistence [Title/Abstract] OR non-persistence[Title/Abstract] OR "Self-Management"[Mesh] OR self-management[Title/Abstract] or self-care[Title/Abstract])
2	Medication	"Prescription Drugs"[Mesh] OR medicine*[Title/Abstract] OR medication*[Title/Abstract] OR drug*[Title/Abstract] OR therap*[Title/Abstract] OR treatment*[Title/Abstract] OR pharmaceutical*[Title/Abstract] OR pill*[Title/Abstract] OR tablet*[Title/Abstract]
3	Medication Adherence	#1 AND #2
4	Behavioural Economics	"Economics, Behavioral"[Mesh] OR behavioral economic*[Text Word] OR behavioural economic*[Text Word] OR behavioural economic*[Title/Abstract] OR behavioral economic*[Title/Abstract] OR anchor*[Title/Abstract] OR choice architecture[Title/Abstract] OR confirmation bias*[Title/Abstract] OR default*[Title/Abstract] OR framing[Title/Abstract] OR framed[Title/Abstract] OR priming[Title/Abstract] OR intertemporal choice[Title/Abstract] OR intertemporal choice[Title/Abstract] OR messenger*[Title/Abstract] OR present bias*[Title/Abstract] OR incentive*[Title/Abstract] OR loss aversion[Title/Abstract] OR endowment effect*[Title/Abstract] OR regret aversion[Title/Abstract] OR reference dependence[Title/Abstract] OR mental accounting[Title/Abstract] OR nudg*[Title/Abstract] OR partitioning[Title/Abstract] OR social norm*[Title/Abstract] OR social proof[Title/Abstract] OR social preference*[Title/Abstract] OR status quo bias*[Title/Abstract] OR inertia[Title/Abstract] OR choice overload[Title/Abstract] OR decision fatigue[Title/Abstract] OR time discount*[Title/Abstract] OR hyperbolic discount*[Title/Abstract] OR time inconsistent preference*[Title/Abstract] OR time inconsistency[Title/Abstract] OR commitment device*[Title/Abstract] OR commitment contract*[Title/Abstract] OR commitment consistency[Title/Abstract] OR precommitment*[Title/Abstract] OR ego effect[Title/Abstract] OR temptation bundl*[Title/Abstract] OR reinforcement*[Title/Abstract] OR gamification[Title/Abstract] OR gaming[Title/Abstract] OR game-

		based[Title/Abstract] OR libertarian paternalism[Title/Abstract] OR prospect theory[Title/Abstract] OR bounded selfishness[Title/Abstract] OR unbounded selfishness[Title/Abstract] OR bounded rational*[Title/Abstract] OR unbounded rational*[Title/Abstract] OR limited rational*[Title/Abstract] OR bounded willpower[Title/Abstract] OR unbounded willpower[Title/Abstract] OR affect heuristic*[Title/Abstract] OR representativeness heuristic*[Title/Abstract] OR availability heuristic*[Title/Abstract] OR overconfidence[Title/Abstract] OR optimism bias*[Title/Abstract] OR limited attention[Title/Abstract] OR mere-measurement[Title/Abstract] OR question-behaviour effect[Title/Abstract] OR hindsight bias*[Title/Abstract] OR knew-it-all-along effect[Title/Abstract] OR salience[Title/Abstract]
<b>5</b>	Medication Adherence AND Behavioural Economics	#3 AND #4
<b>6</b>	Cardiovascular disease	"Cardiovascular Diseases"[Mesh:noexp] OR cardiovascular disease*[Title/Abstract] OR CVD[Title/Abstract] OR "Heart Diseases"[Mesh] OR heart disease*[Title/Abstract] OR "coronary artery disease*" [Title/Abstract] OR "Dyslipidemias"[Mesh] OR dyslipidemia*[Title/Abstract] OR dyslipidaemia*[Title/Abstract] OR hyperlipidemia*[Title/Abstract] OR hyperlipidaemia*[Title/Abstract] OR hypercholesterolemia*[Title/Abstract] OR hypercholesterolaemia*[Title/Abstract] OR "Arteriosclerosis"[Mesh] OR arteriosclerosis[Title/Abstract] OR arterioscleroses[Title/Abstract] OR atherosclerosis[Title/Abstract] OR atheroscleroses[Title/Abstract]
<b>7</b>	Hypertension	"Hypertension"[Mesh] OR hypertension[Title/Abstract] OR blood pressure*[Title/Abstract] OR diastolic[Title/Abstract] OR systolic[Title/Abstract] OR hypertensive[Title/Abstract] OR antihypertensive[Title/Abstract] OR anti-hypertensive[Title/Abstract]
<b>8</b>	Diabetes Type 2	"Diabetes Mellitus, Type 2"[Mesh] OR diabetes[Title/Abstract] OR diabetic*[Title/Abstract] OR "Hyperglycemia"[Mesh] OR hyperglycemia*[Title/Abstract] OR hyperglycaemia*[Title/Abstract] OR glucose intolerance*[Title/Abstract] OR glucose tolerance*[Title/Abstract]
<b>9</b>	HIV	"HIV"[Mesh] OR Human Immunodeficiency Virus*[Title/Abstract] OR Human Immuno-deficiency Virus*[Title/Abstract] OR HIV[Title/Abstract] OR AIDS[Title/Abstract] OR Acquired Immune Deficiency Syndrome*[Title/Abstract]
<b>10</b>	Chronic Kidney Disease	"Renal Insufficiency, Chronic"[Mesh] OR (chronic kidney disease*[Title/Abstract] OR chronic kidney disorder*[Title/Abstract] OR chronic kidney insufficienc*[Title/Abstract] OR chronic

		nephropathy*[Title/Abstract] OR chronic renal disease*[Title/Abstract] OR chronic renal failure*[Title/Abstract] OR chronic renal insufficienc*[Title/Abstract] OR kidney chronic failure*[Title/Abstract])
<b>11</b>	Chronic Diseases	"Chronic Disease"[Mesh] OR chronic[Text Word] OR chronic[Title/Abstract]
<b>12</b>	All Diseases	#6 OR #7 OR #8 OR #9 OR #10 OR #11
<b>13</b>	Medication Adherence AND Behavioural Economics AND Chronic Diseases	#5 AND #12