

BMJ Open Physician-reported barriers to using evidence-based antibiotic prescription guidelines in primary care: protocol for a systematic review and synthesis of qualitative studies using the Theoretical Domains Framework

Krystal Bursey ¹, Amanda Hall,¹ Andrea Pike ¹, Holly Etchegary,² Kris Aubrey-Bassler ¹, Andrea M Patey ³, Kristen Romme⁴

To cite: Bursey K, Hall A, Pike A, *et al.* Physician-reported barriers to using evidence-based antibiotic prescription guidelines in primary care: protocol for a systematic review and synthesis of qualitative studies using the Theoretical Domains Framework. *BMJ Open* 2022;**12**:e066681. doi:10.1136/bmjopen-2022-066681

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-066681>).

Received 18 July 2022

Accepted 05 October 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Krystal Bursey;
kbb816@mun.ca

ABSTRACT

Introduction Overprescription of antibiotics poses a significant threat to healthcare globally as it contributes to the issue of antibiotic resistance. While antibiotics should be predominately prescribed for bacterial infections, they are often inappropriately given for uncomplicated upper respiratory tract infections (URTIs) and related conditions, such as the common cold. This study will involve a qualitative systematic review of physician-reported barriers to using evidence-based antibiotic prescription guidelines in primary care settings and synthesise the findings using a theoretical basis.

Methods and analysis We will conduct a systematic review of qualitative studies that assess physicians' reported barriers to following evidence-based antibiotic prescription guidelines in primary care settings for URTIs. We plan to search the following databases with no date or language restrictions: MEDLINE, Web of Science, CINAHL, Embase, the Cochrane Library and PsycInfo. Qualitative studies that explore the barriers and enablers to following antibiotic prescription guidelines for URTIs for primary care physicians will be included. We will analyse our findings using the Theoretical Domains Framework (TDF), which is a theoretically designed resource based on numerous behaviour change theories grouped into 14 domains. Using the TDF approach, we will be able to identify the determinants of our behaviour of interest (ie, following antibiotic prescription guidelines for URTIs) and categorise them into the 14 TDF domains. This will provide the necessary information to develop future evidence-based interventions that will target the identified issues and apply the most effective behaviour change techniques to affect change. This protocol follows the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols guidelines.

Ethics and dissemination Ethical approval is not required. Findings will be published in a peer-reviewed journal and presented at conferences.

INTRODUCTION

Upper respiratory tract infections (URTIs) are one of the most common diagnoses patients receive in primary care. It has been

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We have prepared this protocol according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols guidelines.
- ⇒ The study will follow a rigorous methodology to identify, appraise and synthesise our findings.
- ⇒ We will analyse our findings using frameworks from behaviour sciences with a strong evidence base for their application in designing and evaluating behaviour change interventions.
- ⇒ This review will be limited by excluding grey literature, which could increase the chance of publication bias.
- ⇒ The analysis may be affected by the research team's experience and personal biases (eg, data analysis will be completed by non-clinicians who do not prescribe antibiotics or have expertise in antibiotic prescription); however, findings will be reviewed in detail by a coauthor (KA-B) who is a practising family physician.

estimated that in 2015, there were over 17 billion instances of URTIs globally.^{1 2} URTIs are infections that cause irritation and swelling of the upper airways. They often involve the nose, sinuses, pharynx, larynx and large airways.³ Symptoms can include a sore throat, cough, runny nose, nasal congestion, headache, low-grade fever and malaise, lasting up to 3 weeks.³ Treatment for URTIs typically includes recommendations for rest, lots of fluids and over-the-counter cold medicines to help with symptoms. Since URTIs are virtually always caused by viral pathogens, not bacteria, they do not respond to antibiotics.^{4 5} Guidelines have been very clear about not prescribing antibiotics for URTIs and only prescribing for several related conditions

such as pharyngitis, bronchitis, sinusitis and otitis media when there are clear indications (see online supplemental appendix 1 for the guidelines and recommendations for antibiotic prescribing for URTIs and related conditions).⁴ However, prescribing antibiotics for these conditions has been an issue globally for decades and does not appear to be decreasing. Rates of inappropriate antibiotic prescribing for URTIs have been reported from anywhere between 15.4% and 60% in outpatient settings.^{6–8}

Overprescribing antibiotics poses a significant threat to healthcare globally as it contributes to the issue of antibiotic resistance.^{5–9–10} Family physicians are one of the primary health providers who prescribe antibiotics for URTIs, and numerous interventions have been developed to improve the quality and quantity of their antibiotic prescribing (eg, patient and provider education, decision support, point-of-care testing and delayed prescribing). While there has been some success for some of these interventions (eg, point-of-care testing, communication training and delayed prescribing), effects sizes are generally small, and no intervention has been able to move the needle so to speak.^{11–13}

What are the barriers to reducing antibiotics for URTIs?

The most recent reviews in this area were completed by Rezal *et al* in 2015 and Germen *et al* in 2018. Rezal *et al* included physicians of any specialisation while Germen *et al* included any healthcare provider who prescribed antibiotics.^{14–15} Reported factors largely fell into one of three categories: physician-related factors (eg, previous clinical experience, continuous medical education, misconceptions about evidence-based prescribing, perceived patient expectations, diagnostic uncertainty, confidence regarding following appropriate prescribing behaviours and desire for a quick fix), patient-related factors (eg, patient's signs and symptoms at the time of the prescription), and healthcare system/resource-related factors (eg, time restrictions, patient load, cost savings and financial incentives).¹⁴ These results are consistent with other reviews that have been completed in this area.¹⁶ Thus, antibiotic prescribing is a complex process with several factors influencing physicians' prescribing behaviours. However, this review only included studies from 1990 to 2014, and since then, several new studies from multiple countries have rendered this information outdated.

Furthermore, this review did not complete a theoretically driven analysis of their data. While their synthesis approach summarised the results, quality and limitations of their included studies to provide useful knowledge on the topic, a theory-driven analysis using a behaviour change theoretical framework can provide more useful information for designing interventions to target the behaviour of inappropriate prescribing of antibiotics for URTIs. Interventions systematically developed based on a theory-informed assessment of the barriers to adopting a behaviour have a better chance of including strategies to change that behaviour effectively.^{17–18}

One comprehensive behaviour change theoretical framework is the Theoretical Domains Framework (TDF). The TDF is an established framework developed by a collaboration of behavioural scientists and implementation researchers to provide a theory-based approach to identifying determinants of behaviour and is a synthesis of 36 behaviour change theories grouped into 14 domains (see online supplemental appendix 2 for the TDF domains and their definitions^{19–20}). Examples of the domains include knowledge, skills, beliefs about capabilities and social influences. The TDF was developed in conjunction with the behaviour change techniques (BCTs) taxonomy. The BCT taxonomy is a list of 93 techniques that can be used for changing behaviour, and these techniques have been linked to the 14 TDF domains (see online supplemental appendix 3 for a list of all BCTs^{19–20}). The TDF and BCT taxonomy are intended to be used together to help design theory-informed behaviour change interventions. As such, Michie *et al*²⁰ provide guidance on selecting the most appropriate BCT (based on the best available evidence, theory and expert consensus) to target an identified TDF barrier or enabler. Using these resources will enable future researchers to design interventions targeting known barriers matched with appropriate BCTs. This approach has been used widely in the literature to understand the barriers and enablers to change behaviour and to underpin the design and evaluation of behaviour change interventions.^{21–26} Pinder *et al*²⁷ published a report nearly a decade ago using a similar methodology to understand antibiotic prescribing. However, this report was not a peer-reviewed systematic review and was largely limited to studies relevant to the UK.²⁸

Our study aims to systematically review barriers and enablers to physicians' antibiotic prescribing behaviours following a framework analysis using the TDF. Much of the literature focuses on quantifying antibiotic prescribing, but a deeper understanding of why overprescribing persists is required to reduce antibiotic prescriptions. Completing this qualitative systematic review will help us better understand why physicians continue to not follow antibiotic guidelines for URTIs and inform intervention design to address these barriers and ultimately improve antibiotic prescribing practices in primary care.

Research question

What are family physician-reported barriers and enablers to following evidence-based antibiotic prescription recommendations for URTIs and related conditions in primary care settings?

Objectives

The objectives for the proposed study are as follows:

1. To conduct a qualitative systematic review of family physicians' perspectives and experiences regarding barriers and enablers to following evidence-based antibiotic prescription recommendations for URTIs and related conditions in primary care settings.

2. To analyse the data collected from the systematic review using the TDF.

METHODS AND ANALYSIS

All methods were designed following the JBI Manual for Evidence Synthesis for Systematic Reviews of Qualitative Evidence.²⁹ This protocol was prepared following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (see online supplemental appendix 4) reporting guidelines, with additional guidance from Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) checklist to ensure we maintain reporting standards in our protocol (see online supplemental appendix 5 for the checklist³⁰). The study's full report will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA³¹) and ENTREQ recommendations for reporting and transparency in qualitative research and systematic reviews to ensure we are maintaining reporting standards for the dissemination of our findings.

Patient and public involvement

This study is part of a larger Canadian Institutes of Health Research-funded grant entitled 'De-implementing low value care: A research program of the Choosing Wisely Canada Implementation Research Network', which involves multi-jurisdictional research across Newfoundland, Ontario and Alberta that focuses on how to support the adoption of Choosing Wisely Canada recommendations. The research team for this grant already has an established patient partner council which was consulted for the identification and prioritisation of this project. In addition, the study results will be reviewed with the patient partner council. They will be invited to participate in the interpretation of the results and asked to help produce all post-publication knowledge translation products, such as a plain-language summary and an infographic.

Eligibility criteria

We have followed the adapted PICO framework to define the question components and eligibility criteria recommended for qualitative reviews, which include the terms Population, Phenomenon of Interest and Context. Our population of interest is family physicians. Our phenomenon of interest is the discussion of the barriers and enablers to following guidelines for antibiotic prescribing for URTIs and related conditions (ie, any barriers to following evidence-based antibiotic guidelines for URTIs or any enabler to not following these guidelines). We have used the most recent Choosing Wisely Canada recommendations for URTI antibiotic prescribing published in 'The Cold Standard' to inform our definition of URTI and related conditions (see online supplemental appendix 1 for details).³² Our context of interest is patients of any age seeking care for URTIs (and related conditions) in primary care settings. See [table 1](#) below for a complete list of inclusion and exclusion criteria for these terms and

criteria for eligible study designs, publication types and publication languages.

Search strategy

An experienced librarian at the Health Sciences Library of Memorial University of Newfoundland has developed a comprehensive search strategy that adheres to PRESS (Peer Review of Electronic Search Strategies) guidelines.³³ Keywords included antibiotic resistance, antibiotics, general practice, acute respiratory tract infections, upper respiratory tract infections, qualitative and family physicians. Databases that will be searched include: MEDLINE, Web of Science, CINAHL, Embase, the Cochrane Library and PsycInfo (see online supplemental appendix 6 for copies of our search strategies). All databases will be searched from database inception to the search date, with no date or language restrictions. To ensure our search is robust, we will conduct reference list screening and citation tracking of all included studies. We have also identified three previous relevant systematic reviews that we will include in our reference screening and citation tracking.^{14–16} Finally, we will contact key content experts in the area to check if any relevant studies they know of have been missed.

Selection process

All titles identified by the initial search will be added to Covidence systematic review software (available from covidence.org), and duplicates will be removed. Two reviewers will screen article titles and abstracts of all studies identified following a screening template with predefined eligibility criteria (see online supplemental appendix 7 for screening template). The screening template will be pilot tested on 20 articles prior to completing the screening of all identified articles. Any conflicts that arise will be resolved by a consensus. If a consensus cannot be achieved, a third investigator will be consulted. Two reviewers will also complete the full-text review following the screening template to select the final articles to be included in the study. A third reviewer will be available to mediate disagreements if a consensus cannot be reached between the reviewers. The screening process will be documented using the PRISMA flow diagram (see online supplemental appendix 4).³⁴

Assessment of methodological quality

To our knowledge, there is currently no risk of bias assessment tool for qualitative studies. Therefore, we will follow the methodology outlined by Hall *et al*,²¹ which has combined elements from the Critical Appraisal Skills Program³⁵ methodological section B on methods and the four methodological domains from the Consolidated Criteria for Reporting Qualitative Research (COREQ³⁶) guidelines (recruitment, data collection, researcher-participant relationship and analysis)³⁵ (see online supplemental appendix 8 for the checklist). Two reviewers will apply this tool to each included study and score each question in the checklist as 'yes', 'no' or 'can't

Table 1 Inclusion and exclusion criteria by PICoS term, languages, publication status, type of publication and date of publication

PICoS term	Inclusion criteria	Exclusion criteria
Population	Family physicians discussing URTIs as defined by the Choosing Wisely Canada guidelines: ▶ Otitis media ▶ Pharyngitis ▶ Sinusitis ▶ Bronchitis ▶ Common cold	Exclude articles that only report about: ▶ Any other illness for which an antibiotic may be prescribed (eg, lower respiratory infections, surgical site infections, infections of teeth/mouth)
Phenomenon of Interest	Family physicians prescribing antibiotics for URTIs	Exclude articles that only report about: ▶ Any other healthcare professional that can prescribe antibiotics (eg, nurse practitioners, pharmacists, physicians of other specialisations)
Context	Patients of any age with URTIs in primary care settings	Exclude articles that only report about: ▶ Patients with URTIs or any other infection or condition in hospital, outpatient (outside of primary care clinics) or ambulatory settings
Study design	Primary qualitative studies (i.e. no reviews) and mixed-method studies if sufficient qualitative data are provided (e.g. separate qualitative data analysis). Studies that collected data via focus groups or interviews	Exclude if: ▶ Single-case studies, survey studies, quantitative studies, interventional studies or studies that summarise results of an original study
Languages	Any language	If an appropriate translator cannot be found, the article will be reported in the number of studies found but not included in the analysis. We considered Google Translate insufficient to translate qualitative data as meaningful data may be lost or misinterpreted using unreliable translation methods.
Publication status	Peer-reviewed journal articles	Book chapters, reviews, summaries, opinion pieces.
Type of publication	Peer-reviewed journal articles	If the full text of an article is unavailable (and contact cannot be made to authors for a copy), data are unpublished or not peer reviewed as the inclusion of these articles is considered controversial.
Date of publication	No restrictions	No exclusions will be made based on date of publication
URTIs, upper respiratory tract infections.		

tell'. Based on these tools and the process used by Hall *et al*,²¹ studies will be given an overall score which will determine if the study will be ranked as having good, moderate or low methodological rigour. Any disagreements will be resolved via a consensus, and a third reviewer will be consulted if necessary.

Assessment of reporting quality

The COREQ checklist will be used to assess reporting quality.³⁶

Data extraction process

Two researchers will extract all data using data extraction templates (see online supplemental appendix 9). Any discrepancies will be resolved via a consensus. The data extraction templates will be piloted on two studies to ensure they capture all the necessary information. Information to be extracted includes study characteristics, including study year, country, setting, sample size, research

aim and data collection methods. Additionally, the results of the included studies will be extracted in terms of the themes of the main findings. We will contact the authors if data are missing or unclear (eg, inclusion criteria such as infection types and specialisation of physicians).

Strategy for data synthesis

Target behaviour

The target behaviour for this analysis is based on Choosing Wisely Canada's evidence-based prescribing guidelines for family physicians—specifically, that antibiotics should not be prescribed for URTIs.

TDF synthesis

To synthesise the extracted data for this review, we will use the TDF to create a framework for content analysis, deductively assigning the results of included studies to one or more TDF domains. Since the domains of the TDF are quite comprehensive in terms of categorising

barriers and enablers that influence behaviour, we do not anticipate identifying any information that does not fit within these domains. However, if we collect data that cannot be coded to any of the TDF domains, we will code the information to a category called 'other', which will be analysed inductively to uncover additional categories that may be used to organise the thematic findings of the studies included in this review. Under the direction of a TDF expert, two researchers will be trained to code extracted data to the TDF domains. We will use data from a previous similar review (on a different topic but using the TDF coding scheme) to practise coding. From this work, the researchers will create a codebook specific to the current study that will act as a guideline and reference to ensure accuracy and consistency. The codebook will contain the coding strategy and a table of coded text, which will define clear methods for making decisions on which domain is appropriate and how to deal with disagreements.

Using NVivo qualitative data analysis software, two researchers will independently code the complete results of the included studies (ie, authors' descriptions of the results, identified themes and subthemes and illustrative participant quotes provided in the results section (or results tables) of included studies). Once both reviewers have independently coded all data to the TDF domains, a summary of the coding results will be reviewed with the research team for discussion and agreement on coding interpretations. Finally, we will analyse the extracted data to determine the number of contributing studies for each theme and to describe the relevant study information to prepare the data for the confidence assessment.

Assessment of confidence in findings

To assess the extent to which a finding is representative of the phenomenon of interest (ie, how representative the results of a study are of the true barriers and enablers to following URTI antibiotic guidelines), we will follow the GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research) approach for assessing the confidence of evidence of reviews of qualitative research. This will allow us to determine how much confidence we can place in the results of the studies we included.³⁷ This approach focuses on four components: the methodological limitations, the relevance of studies to the review question, the coherence of the review findings and the adequacy of data contributing to the review findings. There are four confidence levels: high, moderate, low and very low. Confidence levels are downgraded from high based on the four components. See online supplemental appendix 10 for the detailed criteria we will use for assessing confidence in our findings following the GRADE-CERQual approach based on the criteria from Hall *et al.*²¹ Currently, to our knowledge, there is no standardised assessment tool for publication bias in qualitative research; therefore, this study will not be assessing included studies for this meta-bias.

Ethics and dissemination

Since this review is drawing on already published data, we do not need to undergo formal ethics approval. We plan to publish our findings in an open-access peer-reviewed journal (following ENTREQ guidelines for reporting) and conference presentations. Additionally, we plan to disseminate our findings in non-traditional methods such as infographics or short research videos to improve the visibility of our research findings.

Author affiliations

¹Primary Healthcare Research Unit, Memorial University of Newfoundland, St John's, Newfoundland and Labrador, Canada

²Clinical Epidemiology, Memorial University of Newfoundland, St John's, Newfoundland and Labrador, Canada

³Centre for Implementation Research, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

⁴Medicine, Memorial University of Newfoundland, St John's, Newfoundland and Labrador, Canada

Contributors AH and KB conceptualised and designed this review. AH and KB drafted the protocol. KB, AH, KR and AP developed the search strategy. AH, HE, KA-B, AP and AMP provided feedback on the manuscript for content and methodology. KB, along with AP and AH, will perform study selection and data extraction. AH is the guarantor of this review.

Funding This study is supported by the Canadian Institutes of Health Research (grant number 398 527).

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Krystal Bursey <http://orcid.org/0000-0002-6501-0002>

Andrea Pike <http://orcid.org/0000-0003-4020-2291>

Kris Aubrey-Bassler <http://orcid.org/0000-0001-8680-6838>

Andrea M Patey <http://orcid.org/0000-0002-8770-4494>

REFERENCES

- 1 Fendrick AM, Monto AS, Nightengale B, *et al.* The economic burden of non-influenza-related viral respiratory tract infection in the United States. *Arch Intern Med* 2003;163:487–94.
- 2 GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the global burden of disease study 2015. *Lancet* 2016;388:1545–602.

- 3 Thomas M, Bomar PA. Upper Respiratory Tract Infection. In: *StatPearls [Internet]. Treasure Island*. StatPearls Publishing, 2022. <http://www.ncbi.nlm.nih.gov/books/NBK532961/>
- 4 Choosing Wisely Canada [Internet]. 2022. Available: <https://choosingwiselycanada.org/campaign/antibiotics-primary-care>
- 5 Costelloe C, Metcalfe C, Lovering A, et al. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. *BMJ* 2010;340:c2096.
- 6 Schwartz KL, Langford BJ, Daneman N, et al. Unnecessary antibiotic prescribing in a Canadian primary care setting: a descriptive analysis using routinely collected electronic medical record data. *CMAJ Open* 2020;8:E360–9.
- 7 CDC Newsroom [Internet]. CDC, 2016. Available: <https://www.cdc.gov/media/releases/2016/p0503-unnecessary-prescriptions.html> [Accessed 04 Jul 2022].
- 8 Nowakowska M, van Staa T, Mölter A, et al. Antibiotic choice in UK general practice: rates and drivers of potentially inappropriate antibiotic prescribing. *J Antimicrob Chemother* 2019;74:3371–8.
- 9 Goossens H, Ferech M, Vander Stichele R, et al. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet* 2005;365:579–87.
- 10 de S-BNvan, Grundmann H, Verloo D. Antimicrobial Drug Use and Resistance in Europe - Volume 14, Number 11—November 2008 - Emerging Infectious Diseases journal - CDC. Available: https://wwwnc.cdc.gov/eid/article/14/11/07-0467_article [Accessed 19 Apr 2022].
- 11 McDonagh MS, Peterson K, Winthrop K, et al. Interventions to reduce inappropriate prescribing of antibiotics for acute respiratory tract infections: summary and update of a systematic review. *J Int Med Res* 2018;46:3337–57.
- 12 Tonkin-Crine SK, Tan PS, van Hecke O, et al. Clinician-targeted interventions to influence antibiotic prescribing behaviour for acute respiratory infections in primary care: an overview of systematic reviews. *Cochrane Database Syst Rev* 2017;9:CD012252.
- 13 Köchling A, Löffler C, Reinsch S, et al. Reduction of antibiotic prescriptions for acute respiratory tract infections in primary care: a systematic review. *Implement Sci* 2018;13:47.
- 14 Md Rezal RS, Hassali MA, Alrasheedy AA, et al. Physicians' knowledge, perceptions and behaviour towards antibiotic prescribing: a systematic review of the literature. *Expert Rev Anti Infect Ther* 2015;13:665–80.
- 15 Germini E, Frost J, Garside R, et al. Antibiotic prescribing for acute respiratory tract infections in primary care: an updated and expanded meta-ethnography. *Br J Gen Pract* 2018;68:e633–45.
- 16 Teixeira Rodrigues A, Roque F, Falcão A, et al. Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies. *Int J Antimicrob Agents* 2013;41:203–12.
- 17 Scott C, de Barra M, Johnston M, et al. Using the behaviour change technique taxonomy V1 (BCTTv1) to identify the active ingredients of pharmacist interventions to improve non-hospitalised patient health outcomes. *BMJ Open* 2020;10:e036500.
- 18 Michie S, Abraham C, Whittington C, et al. Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychol* 2009;28:690–701.
- 19 Michie S, Johnston M, Abraham C, et al. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual Saf Health Care* 2005;14:26–33.
- 20 Michie S, Richardson M, Johnston M, et al. The behavior change technique taxonomy (V1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;46:81–95.
- 21 Hall AM, Scurry SR, Pike AE, et al. Physician-reported barriers to using evidence-based recommendations for low back pain in clinical practice: a systematic review and synthesis of qualitative studies using the theoretical domains framework. *Implement Sci* 2019;14:49.
- 22 Mosavianpour M, Sarmast HH, Kisoos N, et al. Theoretical domains framework to assess barriers to change for planning health care quality interventions: a systematic literature review. *J Multidiscip Healthc* 2016;9:303–10.
- 23 Geelen SJG, van Dijk-Huisman HC, de Bie RA, et al. Barriers and enablers to physical activity in patients during hospital stay: a scoping review. *Syst Rev* 2021;10:293.
- 24 Phillips CJ, Marshall AP, Chaves NJ, et al. Experiences of using the theoretical domains framework across diverse clinical environments: a qualitative study. *J Multidiscip Healthc* 2015;8:139–46.
- 25 Weatherson KA, Gainforth HL, Jung ME. A theoretical analysis of the barriers and facilitators to the implementation of school-based physical activity policies in Canada: a mixed methods scoping review. *Implement Sci* 2017;12:41.
- 26 Dyson J, Cowdell F. How is the theoretical domains framework applied in designing interventions to support healthcare practitioner behaviour change? A systematic review. *Int J Qual Health Care* 2021;33:mzab106.
- 27 Chadborn T, Berry D, Sallis A, et al. Behaviour change and antibiotic prescribing in healthcare settings- literature review and behavioural analysis. published by public health England, Wellington house (London). *Ann Behav Med*;46:81–95.
- 28 Antibiotic prescribing and behaviour change in healthcare settings [Internet]. GOV.UK. Available: <https://www.gov.uk/government/publications/antibiotic-prescribing-and-behaviour-change-in-healthcare-settings>
- 29 Lockwood C, Porrit K, Munn Z. Chapter 2: Systematic reviews of qualitative evidence. In: JBI Manual for Evidence Synthesis [Internet]. JBI 2020.
- 30 Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181.
- 31 Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1.
- 32 The Cold Standard [Internet]. Choosing Wisely Canada. Available: <https://choosingwiselycanada.org/toolkit/the-cold-standard/>
- 33 McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40–6.
- 34 Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.
- 35 Long HA, French DP, Brooks JM. Optimising the value of the critical appraisal skills programme (CASP) tool for quality appraisal in qualitative evidence synthesis. *Res Methods Med Health Sci* 2020;1:31–42.
- 36 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349–57.
- 37 Lewin S, Glenton C, Munthe-Kaas H, et al. Using qualitative evidence in decision making for health and social interventions: an approach to assess confidence in findings from qualitative evidence syntheses (GRADE-CERQual). *PLoS Med* 2015;12:e1001895.