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

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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

Check for updates

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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.

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.

INTRODUCTION

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

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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 Germeni *et al* in 2018. Rezal *et al* included physicians of any specialisation while Germeni *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.

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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 checklist[30]). The study's full report will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA[31]) 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 Program[35] methodological section B on methods and the four methodological domains from the Consolidated Criteria for Reporting Qualitative Research (COREQ[36]) 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

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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

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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.

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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.

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Appendix 1: Choosing Wisely Guidelines Canada for Antibiotic Prescribing by URTI and Related Conditions

URTI Condition	Definition	Recommendation
The Common Cold (Upper respiratory infection)	The common cold refers to a mild upper respiratory viral illness that is distinct from illnesses like influenza, pharyngitis, acute sinusitis, acute bronchitis, allergic rhinitis, and pertussis. [1]	Do not prescribe antibiotics unless there is clear evidence of a secondary bacterial infection (see otitis media, pharyngitis, sinusitis, pneumonia recommendations.
Pharyngitis	Pharyngitis is commonly known as a sore throat and refers to the inflammation of the pharynx (the back of the throat;[2]).	Do not prescribe antibiotics unless the patient's modified centor score is >2 and a throat swab culture (or rapid antigen test) demonstrates the presence of Group A Streptococcus.
Sinusitis	Sinusitis refers to the inflammation of the nasal cavity and paranasal sinuses.[3]	Do not prescribe antibiotics unless symptoms have persisted for greater than 7-10 days without improvement. Antibiotics should only be considered if patients: 1. Have at least 2 of the following: pain, nasal obstruction, discharge or hyposmia/anosmia, with one of those being nasal obstruction or discharge 2. Meet one of the following criteria: a. The symptoms are severe b. The symptoms are mild to moderate if there is no response after a 72 hour trial with nasal corticosteroids.
Otitis Media	Otitis media refers to infection of the middle ear fluid and inflammation of the mucosa lining the middle ear space.[4]	Do not prescribe antibiotics in vaccinated children six months or older and adults unless they present with a perforated tympanic membrane with purulent discharge or a bulging tympanic membrane with one of the following three criteria: 1. Fever (≥39°C) 2. Moderately or severely ill Significant symptoms lasting > 48

		hours
Bronchitis	Bronchitis is a respiratory tract infection of the large airways. [5]	Never prescribe antibiotics.

1. Sexton D, McClain M. The common cold in adults: Diagnosis and clinical features. [Internet]. Up to Date; 2021. Available from: https://www.uptodate.com/contents/the-common-cold-in-adults-diagnosis-and-clinical-features?search=upper%20respiratory%20infection&topicRef=6868&source=see_link

2. Chow A, Doron S. Evaluation of acute pharyngitis in adults [Internet]. Up to Date; 2020. Available from: https://www.uptodate.com/contents/evaluation-of-acute-pharyngitis-in-adults?search=pharyngitis&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

3. Patel Z, Hwang P. Uncomplicated acute sinusitis and rhinosinusitis in adults: Treatment [Internet]. Up to Date; 2021. Available from: https://www.uptodate.com/contents/uncomplicated-acute-sinusitis-and-rhinosinusitis-in-adults-treatment?search=Sinusitis&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

4. Limb C, Lustig L, Durand M. Acute otitis media in adults [Internet]. Up to Date; 2022. Available from: https://www.uptodate.com/contents/acute-otitis-media-in-adults?search=Uncomplicated%20Otitis%20Media&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

5. File T. Acute bronchitis in adults [Internet]. Up to Date; 2022 May. Available from: https://www.uptodate.com/contents/acute-bronchitis-in-adults?search=bronchitis&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

Appendix 2: TDF Domains and Their Definitions

Domain	Definition
Knowledge	An awareness of the existence of something.
Skills	An ability or proficiency acquired through practice.
Social/professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting.
Beliefs about capabilities	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use.
Optimism	The confidence that things will happen for the best or that desired goals will be attained.
Beliefs about consequences	Acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation.
Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus.
Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way.
Goals	Mental representations of outcomes or end states that an individual wants to achieve.
Memory, attention, and decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives.
Environmental context and resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour.
Social influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours.
Emotion	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event.
Behavioural regulation	Anything aimed at managing or changing objectively observed or measured actions.

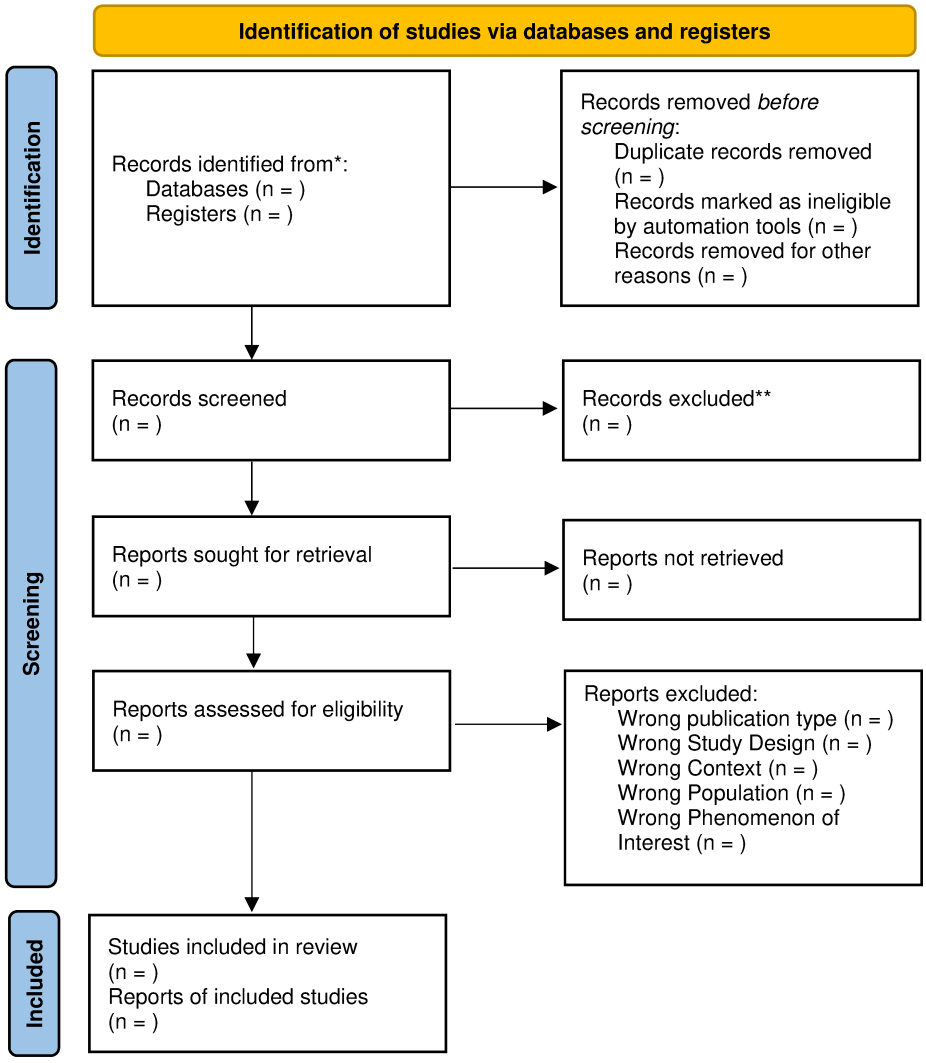
* Reproduced from [6]

Appendix 3: List of Behaviour Change Techniques

Page	Grouping and BCTs
1	**1. Goals and planning**
	1.1. Goal setting (behavior) 1.2. Problem solving 1.3. Goal setting (outcome) 1.4. Action planning 1.5. Review behavior goal(s) 1.6. Discrepancy between current behavior and goal 1.7. Review outcome goal(s) 1.8. Behavioral contract 1.9. Commitment
3	**2. Feedback and monitoring**
	2.1. Monitoring of behavior by others without feedback 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behavior without feedback 2.6. Biofeedback 2.7. Feedback on outcome(s) of behavior
5	**3. Social support**
	3.1. Social support (unspecified) 3.2. Social support (practical) 3.3. Social support (emotional)
6	**4. Shaping knowledge**
	4.1. Instruction on how to perform the behavior 4.2. Information about Antecedents 4.3. Re-attribution 4.4. Behavioral experiments
7	**5. Natural consequences**
	5.1. Information about health consequences 5.2. Salience of consequences 5.3. Information about social and environmental consequences 5.4. Monitoring of emotional consequences 5.5. Anticipated regret 5.6. Information about emotional consequences
8	**6. Comparison of behaviour**
	6.1. Demonstration of the behavior 6.2. Social comparison 6.3. Information about others' approval
9	**7. Associations**
	7.1. Prompts/cues 7.2. Cue signalling reward 7.3. Reduce prompts/cues 7.4. Remove access to the reward 7.5. Remove aversive stimulus 7.6. Satiation 7.7. Exposure 7.8. Associative learning
10	**8. Repetition and substitution**
	8.1. Behavioral practice/rehearsal 8.2. Behavior substitution 8.3. Habit formation 8.4. Habit reversal 8.5. Overcorrection 8.6. Generalisation of target behavior 8.7. Graded tasks
11	**9. Comparison of outcomes**
	9.1. Credible source 9.2. Pros and cons 9.3. Comparative imagining of future outcomes
12	**10. Reward and threat**
	10.1. Material incentive (behavior) 10.2. Material reward (behavior) 10.3. Non-specific reward 10.4. Social reward 10.5. Social incentive 10.6. Non-specific incentive 10.7. Self-incentive 10.8. Incentive (outcome) 10.9. Self-reward 10.10. Reward (outcome) 10.11. Future punishment
15	**11. Regulation**
	11.1. Pharmacological support 11.2. Reduce negative emotions 11.3. Conserving mental resources 11.4. Paradoxical instructions
16	**12. Antecedents**
	12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.3. Avoidance/reducing exposure to cues for the behavior 12.4. Distraction 12.5. Adding objects to the environment 12.6. Body changes
17	**13. Identity**
	13.1. Identification of self as role model 13.2. Framing/reframing 13.3. Incompatible beliefs 13.4. Valued self-identify 13.5. Identity associated with changed behavior
18	**14. Scheduled consequences**
	14.1. Behavior cost 14.2. Punishment 14.3. Remove reward 14.4. Reward approximation 14.5. Rewarding completion 14.6. Situation-specific reward 14.7. Reward incompatible behavior 14.8. Reward alternative behavior 14.9. Reduce reward frequency 14.10. Remove punishment
19	**15. Self-belief**
	15.1. Verbal persuasion about capability 15.2. Mental rehearsal of successful performance 15.3. Focus on past success 15.4. Self-talk
19	**16. Covert learning**
	16.1. Imaginary punishment 16.2. Imaginary reward 16.3. Vicarious consequences

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M. P., Cane, J., & Wood, C. E. 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.

Appendix 4: PRISMA flowchart & checklist



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.or

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Include the Page number where this information is located your manuscript
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	N/A
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author.	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	14
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			15
Sources	5a	Indicate sources of financial or other support for the review	
Sponsor	5b	Provide name for the review funder and/or sponsor	
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	4-7
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	7
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	8-10

Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	10-11
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Appendix 6
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	11
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	11
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	12
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	12
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	12
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	11-12
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	N/A
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	N/A
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	N/A
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	12-13
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	N/A
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	13-14

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Appendix 5: ENTREQ Checklist

No	Item	Guide and Description	Pg.
1	Aim	State the research question the synthesis addresses.	
2	Synthesis methodology	Identify the synthesis methodology or theoretical framework which underpins the synthesis, and describe the rationale for choice of methodology (e.g. meta-ethnography, thematic synthesis, critical interpretive synthesis, grounded theory synthesis, realist synthesis, meta-aggregation, meta-study, framework synthesis).	
3	Approach to searching	Indicate whether the search was pre-planned (comprehensive search strategies to seek all available studies) or iterative (to seek all available concepts until they theoretical saturation is achieved).	
4	Inclusion criteria	Specify the inclusion/exclusion criteria (e.g. in terms of population, language, year limits, type of publication, study type).	
5	Data sources	Describe the information sources used (e.g. electronic databases (MEDLINE, EMBASE, CINAHL, psycINFO, Econlit), grey literature databases (digital thesis, policy reports), relevant organizational websites, experts, information specialists, generic web searches (Google Scholar) hand searching, reference lists) and when the searches conducted; provide the rationale for using the data sources.	
6	Electronic search strategy	Describe the literature search (e.g. provide electronic search strategies with population terms, clinical or health topic terms, experiential or social phenomena related terms, filters for qualitative research, and search limits).	
7	Study screening methods	Describe the process of study screening and sifting (e.g. title, abstract and full text review, number of independent reviewers who screened studies).	
8	Study characteristics	Present the characteristics of the included studies (e.g. year of publication, country, population, number of participants, data collection, methodology, analysis, research questions).	
9	Study selection results	Identify the number of studies screened and provide reasons for study exclusion (e,g, for comprehensive searching, provide numbers of studies screened and reasons for exclusion indicated in a figure/flowchart; for iterative searching describe reasons for study exclusion and inclusion based on modifications t the research question and/or contribution to theory development).	
10	Rationale for appraisal	Describe the rationale and approach used to appraise the included studies or selected findings (e.g. assessment of conduct (validity and robustness), assessment of reporting (transparency), assessment of content and utility of the	

		findings).	
11	Appraisal items	State the tools, frameworks and criteria used to appraise the studies or selected findings (e.g. Existing tools: CASP, QARI, COREQ; reviewer developed tools; describe the domains assessed: research team, study design, data analysis and interpretations, reporting).	
12	Appraisal process	Indicate whether the appraisal was conducted independently by more than one reviewer and if consensus was required.	
13	Appraisal results	Present results of the quality assessment and indicate which articles, if any, were weighted/excluded based on the assessment and give the rationale.	
14	Data extraction	Indicate which sections of the primary studies were analyzed and how were the data extracted from the primary studies? (e.g. all text under the headings "results /conclusions" were extracted electronically and entered into a computer software).	
15	Software	State the computer software used, if any.	
16	Number of reviewers	Identify who was involved in coding and analysis.	
17	Coding	Describe the process for coding of data (e.g. line by line coding to search for concepts).	
18	Study comparison	Describe how were comparisons made within and across studies (e.g. subsequent studies were coded into pre-existing concepts, and new concepts were created when deemed necessary).	
19	Derivation of themes	Explain whether the process of deriving the themes or constructs was inductive or deductive.	
20	Quotations	Provide quotations from the primary studies to illustrate themes/constructs, and identify whether the quotations were participant quotations of the author's interpretation.	
21	Synthesis output	Present rich, compelling and useful results that go beyond a summary of the primary studies (e.g. new interpretation, models of evidence, conceptual models, analytical framework, development of a new theory or construct).	

Tong A, Flemming K, McInnes E, Oliver S, Craig J. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res Methodol*. 2012;12:181

Appendix 6: Sample Search Strategy

Database: Ovid MEDLINE(R) ALL

1 Respiratory Tract Infections/
2 (respiratory adj2 infect*).tw,kf.
3 (urti or urtis).tw,kf.
4 exp Otitis Media/
5 (otitis or earache* or ear ache* or (ear adj1 infect*) or (ear adj1 inflam*)).tw,kf.
6 exp Pharyngitis/
7 (pharyngitis or nasopharyngitis or rhinopharyngitis or tonsillopharyngitis or tonsillitis or peritonsillar abscess* or retropharyngeal abscess* or sore throat*).tw,kf.
8 exp Sinusitis/
9 (sinusitis or rhinosinusitis).tw,kf.
10 exp Bronchitis/
11 (bronchitis or bronchiolitis).tw,kf.
12 Common Cold/
13 common cold*.tw,kf.
14 or/1-13
15 Anti-Bacterial Agents/
16 (antibiotic* or anti biotic* or antibacterial* or anti bacterial* or antimicrobial* or anti microbial*).tw,kf.
17 or/15-16
18 Primary Health Care/ or Physicians, Primary Care/ or exp General Practice/ or General Practitioners/ or Physicians, Family/
19 (primary care or primary health care or primary healthcare or general practi* or general physician* or GP or GPs or family practi* or family physician* or family doctor* or family medic*).tw,kf.
20 or/18-19
21 Attitude/ or "Attitude of Health Personnel"/ or Motivation/ or Intention/
22 (barrier* or obstacle* or challeng* or hinder* or hindrance* or disincentiv* or facilitat* or enabl* or incentiv* or attitude* or opinion* or perspective* or perception* or perceive* or view* or belie* or experience* or knowledge or understanding or motivat* or (factor* adj2 (influenc* or impact* or affect*))).tw,kf.
23 Qualitative Research/
24 Focus Groups/
25 Interview/ or "Interviews as Topic"/
26 Grounded Theory/
27 (qualitative or interview* or focus group* or ((thematic* or comparative*) adj1 analy*) or lived experience* or mixed method* or grounded theory or phenomenolog* or ethnograph*).tw,kf.
28 or/21-27

29 14 and 17 and 20 and 28

Embase (via Embase.com)

	Embase Query
#1	'respiratory tract infection'/de OR 'upper respiratory tract infection'/de OR 'viral upper respiratory tract infection'/de
#2	(respiratory NEAR/2 infect*):ti,ab,kw
#3	urti:ti,ab,kw OR urtis:ti,ab,kw
#4	'otitis media'/exp
#5	otitis:ti,ab,kw OR earache*:ti,ab,kw OR 'ear ache*':ti,ab,kw OR ((ear NEAR/1 infect*):ti,ab,kw) OR ((ear NEAR/1 inflam*):ti,ab,kw)
#6	'pharyngitis'/exp
#7	pharyngitis:ti,ab,kw OR nasopharyngitis:ti,ab,kw OR rhinopharyngitis:ti,ab,kw OR tonsillopharyngitis:ti,ab,kw OR tonsillitis:ti,ab,kw OR 'peritonsillar abscess*':ti,ab,kw OR 'retropharyngeal abscess*':ti,ab,kw OR 'sore throat*':ti,ab,kw
#8	'sinusitis'/exp
#9	sinusitis:ti,ab,kw OR rhinosinusitis:ti,ab,kw
#10	'bronchitis'/exp
#11	bronchitis:ti,ab,kw OR bronchiolitis:ti,ab,kw
#12	'common cold'/de
#13	'common cold*':ti,ab,kw
#14	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13
#15	'antiinfective agent'/de OR 'antibiotic agent'/de
#16	antibiotic*:ti,ab,kw OR 'anti biotic*':ti,ab,kw OR antibacterial*:ti,ab,kw OR 'anti bacterial*':ti,ab,kw OR antimicrobial*:ti,ab,kw OR 'anti microbial*':ti,ab,kw
#17	#15 OR #16
#18	'primary health care'/exp OR 'general practice'/de OR 'general practitioner'/de
#19	'primary care':ti,ab,kw OR 'primary health care':ti,ab,kw OR 'primary healthcare':ti,ab,kw OR 'general practi*':ti,ab,kw OR 'general physician*':ti,ab,kw OR gp:ti,ab,kw OR gps:ti,ab,kw OR 'family practi*':ti,ab,kw OR 'family physician*':ti,ab,kw OR 'family doctor*':ti,ab,kw OR 'family medic*':ti,ab,kw
#20	#18 OR #19
#21	'attitude'/de OR 'health personnel attitude'/de OR 'physician attitude'/de OR 'patient attitude'/de OR 'motivation'/exp
#22	barrier*:ti,ab,kw OR obstacle*:ti,ab,kw OR challeng*:ti,ab,kw OR hinder*:ti,ab,kw OR hindrance*:ti,ab,kw OR disincentiv*:ti,ab,kw OR facilitat*:ti,ab,kw OR enabl*:ti,ab,kw OR incentiv*:ti,ab,kw OR attitude*:ti,ab,kw OR opinion*:ti,ab,kw OR perspective*:ti,ab,kw OR

	perception*:ti,ab,kw OR perceive*:ti,ab,kw OR view*:ti,ab,kw OR belie*:ti,ab,kw OR experience*:ti,ab,kw OR knowledge:ti,ab,kw OR understanding:ti,ab,kw OR motivat*:ti,ab,kw OR ((factor* NEAR/2 (influenc* OR impact* OR affect*)):ti,ab,kw)
#23	'qualitative research'/exp
#24	'focus group'/exp
#25	'interview'/exp
#26	'grounded theory'/de
#27	'thematic analysis'/de
#28	qualitative:ti,ab,kw OR interview*:ti,ab,kw OR 'focus group*':ti,ab,kw OR (((thematic* OR comparative*) NEAR/1 analy*):ti,ab,kw) OR 'lived experience*':ti,ab,kw OR 'mixed method*':ti,ab,kw OR 'grounded theory':ti,ab,kw OR phenomenolog*:ti,ab,kw OR ethnograph*:ti,ab,kw
#29	#21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28
#30	#14 AND #17 AND #20 AND #29

Cochrane Library (via Wiley)

ID	Cochrane Library Query
#1	[mh ^"Respiratory Tract Infections"]
#2	(respiratory NEAR/1 infect*):ti,ab,kw
#3	(urti OR urtis):ti,ab,kw
#4	[mh "Otitis Media"]
#5	(otitis OR earache* OR (ear NEXT ache*) OR (ear NEXT infect*) OR (ear NEXT inflam*)):ti,ab,kw
#6	[mh Pharyngitis]
#7	(pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR (peritonsillar NEXT abscess*) OR (retropharyngeal NEXT abscess*) OR (sore NEXT throat*)):ti,ab,kw
#8	[mh Sinusitis]
#9	(sinusitis OR rhinosinusitis):ti,ab,kw
#10	[mh Bronchitis]
#11	(bronchitis OR bronchiolitis):ti,ab,kw
#12	[mh ^"Common Cold"]
#13	(common NEXT cold*):ti,ab,kw
#14	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13
#15	[mh "Anti-Bacterial Agents"]
#16	(antibiotic* OR (anti NEXT biotic*) OR antibacterial* OR (anti NEXT bacterial*) OR antimicrobial* OR (anti NEXT microbial*)):ti,ab,kw
#17	#15 OR #16

#18	[mh ^"Primary Health Care"] OR [mh ^"Physicians, Primary Care"] OR [mh "General Practice"] OR [mh ^"General Practitioners"] OR [mh ^"Physicians, Family"]
#19	("primary care" OR "primary health care" OR "primary healthcare" OR (general NEXT practi*) OR (general NEXT physician*) OR GP OR GPs OR (family NEXT practi*) OR (family NEXT physician*) OR (family NEXT doctor*) OR (family NEXT medic*)):ti,ab,kw
#20	#18 OR #19
#21	[mh ^Attitude] OR [mh ^"Attitude of Health Personnel"] OR [mh ^Motivation] OR [mh ^Intention]
#22	(barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* NEAR/1 (influenc* OR impact* OR affect*))):ti,ab,kw
#23	[mh ^"Qualitative Research"]
#24	[mh ^"Focus Groups"]
#25	[mh ^Interview] OR [mh ^"Interviews as Topic"]
#26	[mh ^"Grounded Theory"]
#27	(qualitative OR interview* OR focus group* OR ((thematic* OR comparative*) NEAR/1 analy*) OR (lived NEXT experience*) OR (mixed NEXT method*) OR "grounded theory" OR phenomenolog* OR ethnograph*):ti,ab,kw
#28	#21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27
#29	#14 AND #17 AND #20 AND #28

APA PsycINFO (EBSCOhost)

#	APA PsycINFO Query
S1	DE "Respiratory Tract Disorders"
S2	TI (respiratory N1 infect*) OR AB (respiratory N1 infect*) OR KW (respiratory N1 infect*)
S3	TI (urti OR urtis) OR AB (urti OR urtis) OR KW (urti OR urtis)
S4	TI ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*)) OR AB ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*)) OR KW ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*))
S5	TI (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*") OR AB (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*") OR KW (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*")
S6	TI (sinusitis OR rhinosinusitis) OR AB (sinusitis OR rhinosinusitis) OR KW (sinusitis OR rhinosinusitis)
S7	TI (bronchitis OR bronchiolitis) OR AB (bronchitis OR bronchiolitis) OR KW (bronchitis OR bronchiolitis)

S8	TI ("common cold*") OR AB ("common cold*") OR KW ("common cold*")
S9	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8
S10	DE "Antibiotics"
S11	TI (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*") OR AB (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*") OR AB (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*")
S12	S10 OR S11
S13	DE "Primary Health Care" OR DE "Family Medicine" OR DE "Family Physicians" OR DE "General Practitioners"
S14	TI ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*") OR AB ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*") OR KW ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*")
S15	S13 OR S14
S16	DE "Attitudes" OR DE "Health Attitudes" OR DE "Health Personnel Attitudes" OR DE "Motivation" OR DE "Intention" OR DE "Behavioral Intention"
S17	TI (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*))) OR AB (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*))) OR KW (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*)))
S18	DE "Qualitative Methods"
S19	DE "Focus Group" OR DE "Focus Group Interview"
S20	DE "Interviews" OR DE "Semi-Structured Interview"
S21	DE "Grounded Theory"
S22	DE "Interpretative Phenomenological Analysis" OR DE "Narrative Analysis" OR DE "Thematic Analysis"
S23	TI (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*) OR AB (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*) OR KW (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*)

S24	S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23
S25	S9 AND S12 AND S15 AND S24

CINAHL Plus with Full Text (EBSCOhost)

#	CINAHL Query
S01	(MH "Respiratory Tract Infections")
S02	TI (respiratory N1 infect*) OR AB (respiratory N1 infect*) OR KW (respiratory N1 infect*)
S03	TI (urti OR urtis) OR AB (urti OR urtis) OR KW (urti OR urtis)
S04	(MH "Otitis Media+")
S05	TI ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*)) OR AB ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*)) OR KW ((otitis OR earache* OR "ear ache*" OR (ear N0 infect*) OR (ear N0 inflam*))
S06	(MH "Pharyngitis")
S07	TI (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*") OR AB (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*") OR KW (pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*")
S08	(MH "Sinusitis+")
S09	TI (sinusitis OR rhinosinusitis) OR AB (sinusitis OR rhinosinusitis) OR KW (sinusitis OR rhinosinusitis)
S10	(MH "Bronchitis+")
S11	TI (bronchitis OR bronchiolitis) OR AB (bronchitis OR bronchiolitis) OR KW (bronchitis OR bronchiolitis)
S12	(MH "Common Cold")
S13	TI ("common cold*") OR AB ("common cold*") OR KW ("common cold*")
S14	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13
S15	(MH "Antibiotics")
S16	TI (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*") OR AB (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*") OR AB (antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*")
S17	S15 OR S16
S18	(MH "Primary Health Care") OR (MH "Physicians, Family") OR (MH "Family Practice")
S19	TI ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR

	"general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*") OR AB ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*") OR KW ("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*")
S20	S18 OR S19
S21	(MH "Attitude") OR (MH "Attitude of Health Personnel") OR (MH "Physician Attitudes") OR (MH "Attitude to Medical Treatment") OR (MH "Attitude to Health+") OR (MH "Patient Attitudes") OR (MH "Motivation")
S22	TI (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*))) OR AB (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*))) OR KW (barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* N1 (influenc* OR impact* OR affect*)))
S23	(MH "Qualitative Studies+")
S24	(MH "Focus Groups")
S25	(MH "Interviews+") OR (MH "Narratives")
S26	TI (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*) OR AB (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*) OR KW (qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) N1 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*)
S27	S21 OR S22 OR S23 OR S24 OR S25 OR S26
S28	S14 AND S17 AND S20 AND S27

Web of Science Core Collection

Editions:

- Science Citation Index Expanded (SCI-EXPANDED)--1900-present
- Social Sciences Citation Index (SSCI)--1956-present
- Arts & Humanities Citation Index (AHCI)--1975-present
- Emerging Sources Citation Index (ESCI)--2017-present

	Web of Science Query

1	TS=(respiratory NEAR/1 infect*)
2	TS=(urti OR urtis)
3	TS=(otitis OR earache* OR "ear ache*" OR (ear NEAR/0 infect*) OR (ear NEAR/0 inflam*))
4	TS=(pharyngitis OR nasopharyngitis OR rhinopharyngitis OR tonsillopharyngitis OR tonsillitis OR "peritonsillar abscess*" OR "retropharyngeal abscess*" OR "sore throat*")
5	TS=(sinusitis OR rhinosinusitis)
6	TS=(bronchitis OR bronchiolitis)
7	TS=("common cold*")
8	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7
9	TS=(antibiotic* OR "anti biotic*" OR antibacterial* OR "anti bacterial*" OR antimicrobial* OR "anti microbial*")
10	TS=("primary care" OR "primary health care" OR "primary healthcare" OR "general practi*" OR "general physician*" OR GP OR GPs OR "family practi*" OR "family physician*" OR "family doctor*" OR "family medic*")
11	TS=(barrier* OR obstacle* OR challeng* OR hinder* OR hindrance* OR disincentiv* OR facilitat* OR enabl* OR incentiv* OR attitude* OR opinion* OR perspective* OR perception* OR perceive* OR view* OR belie* OR experience* OR knowledge OR understanding OR motivat* OR (factor* NEAR/1 (influenc* OR impact* OR affect*)))
12	TS=(qualitative OR interview* OR "focus group*" OR ((thematic* OR comparative*) NEAR/0 analy*) OR "lived experience*" OR "mixed method*" OR "grounded theory" OR phenomenolog* OR ethnograph*)
13	#11 OR #12
14	#8 AND #9 AND #10 AND #13

Appendix 7: Screening Form Template

Screening Form Example – Phase 1: Title and Abstract Screening

Population:	
INCLUDE	EXCLUDE
Family physicians discussing URTIs as defined by the Choosing Wisely Canada Guidelines: - Otitis Media - Pharyngitis - Sinusitis - Bronchitis - The common cold	Any other healthcare professional that can prescribe antibiotics (e.g., nurse practitioners, pharmacists, physicians of other specializations). If the findings contain a mixture of healthcare professionals, we will exclude the study if the FP results cannot be separately extracted or if >25% of the sample contains non-family physicians, as the data will then be considered unrepresentative. If uncertain, include for full-text review

Phenomenon of Interest:	
INCLUDE	EXCLUDE
Barriers and enablers for family physicians for managing URTIs following evidence-based prescribing guidelines for antibiotics.	Report physicians' perspectives and experiences for any other infection/condition, and the barriers related to URTIs and related conditions defined by Choosing Wisely Guidelines for Canada cannot be extracted from the other included conditions. If uncertain, include for full-text review

Context:	
INCLUDE	EXCLUDE
Patients of any age with URTIs in primary care settings.	- Patients with URTIs or any other infection or condition in hospital, outpatient (outside of primary care clinics) or ambulatory settings.

	If uncertain, include for full-text review

Study Design:	
INCLUDE	EXCLUDE
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.	Single-case studies, quantitative studies, interventional studies, survey studies or studies that summarize the results of an original study. These studies do not contain enough information to conduct our analysis. Exclude if: - Single-case studies, quantitative studies, interventional studies, or studies that summarize results of an original study. If uncertain, include for full-text review

Publication Type:	
INCLUDE	EXCLUDE
Published, full-text available	Full-text unavailable, unpublished/grey literature If uncertain, include for full-text review

Screening Form Example – Phase 2: Full Text Screening

General instructions:

- The order of these reasons for exclusion matches the order in the flowchart
- I've arranged the list in order of when we're likely to figure out the reasons for exclusion, e.g. publication type may be the first reason for exclusion we see, so chose that.
- Look and choose the reason for exclusion as soon as you spot it **in the order below.** At this stage, conflicts can arise not only for conflicting votes on including or excluding a study, e.g.

if I choose language as the reason for exclusion for study X, and someone else chooses publication type for reason for exclusion, this will be marked as a conflict.

- An article can have more than one reason for exclusion, but we are going to go in this specific order to try to minimize conflicts.
- For those articles that are incomplete, I will contact authors to try to get all the necessary information.

Publication Type:	
INCLUDE	EXCLUDE
Peer-reviewed journal articles	Book chapters, reviews, summaries, opinion pieces

Study Design:	
INCLUDE	EXCLUDE
All types of primary qualitative studies (i.e. no reviews) and mixed method studies if sufficient qualitative data are provided (e.g. separate qualitative data analysis).	Exclude if: - Single-case studies, quantitative studies, interventional studies, or studies that summarize results of an original study.

Context:	
INCLUDE	EXCLUDE
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. If results for primary care settings only cannot be differentiated or extracted, **exclude.**

Population:

INCLUDE	EXCLUDE
Any URTI outlined in the Choosing Wisely Canada Guidelines: - Otitis Media - Pharyngitis - Sinusitis - The common cold - Bronchitis	Exclude articles that **ONLY** report about: - Any other illness for which an antibiotic may be prescribed (e.g., lower respiratory infections, surgical site infections, infections of teeth/mouth) If results for URTIs only cannot be differentiated or extracted, **exclude.**

Phenomenon of Interest:	
INCLUDE	EXCLUDE
Family physicians prescribing antibiotics for URTIs.	Exclude articles that **ONLY** report about: - Any other healthcare professional that can prescribe antibiotics (e.g., nurse practitioners, pharmacists, physicians of other specializations). If results for family physicians only cannot be differentiated or extracted, **exclude.**

* Screening form adapted from: Screening for studies in systematic, scoping, and other knowledge syntheses: strategies for improvement. Prepared by, Ayala, AP. Last modified April 28, 2020. Gerstein Science Information Cente

Appendix 8: Assessment of Reporting Criteria According to the Guidance from CASP and COREQ

Reporting Criteria	Study 1	Study 2	Study 3	Study 4 etc.
1. Aim				
Aim explicitly stated and revelant				
2. Qualitative Approach				
Design aligned to aim				
Theoretical framework reported				
3. Design				
Design aligned to aims				
Design appropriately justified				
4. Recruitment				
A priori participant selection criteria				
Recruitment strategy explained for replication				
Purposive sampling used				
5. Data Collection				
Data collection explicit, enabling replication				
Research setting identified				
Focus group, interview, survey described				
Data recorded and transcribed				
Field notes taken				
Data saturation reported				
6. Researcher-participant relationship				
Interviewer level of influence of described				
Interviewer identified and described				
7. Ethical Issues				
Ethics committee approval obtained				
Explanation of the study given				
Informed consent obtained				
Anonymous transcripts used				
Confidentiality described				
8. Analysis				
Type (thematic, content)				
Explicit steps of analysis process				
2 researchers performed analysis				
Quotations to support findings				
Contrary observations				
9. Findings				
Explicit statement of findings				
Credibility				
Discussion linked to aims/literature				
Strengths and limitations				

10. Value				
Contribution to knowledge base				
Transferability (generalizability)				
Recommendations for practices				
Recommendations for research				

Reproduced from: Hall AM, Scurrey SR, Pike AE, Albury C, Richmond HL, Matthews J, 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.

Appendix 9: Data extraction table samples

Table 1. Descriptive Characteristics of Included Studies

Study, Year	Country	Setting	Sample Size	Research Aim	Data Collection Method

Table 2. Summary of findings regarding physician-reported barriers to following antibiotic prescription guidelines

TDF Domain	TDF sub-domain	Specific theme from the study	Studies (participants)	Confidence in the evidence	Explanation

Appendix 10: Criteria used for assessing confidence in the evidence supporting the review findings using the CERQual approach

Component	Definition	Threats to Component	Do not Downgrade Confidence Level		Downgrade Confidence Level	
			No or very little concerns	Minor Concerns	Moderate Concerns	Serious Concerns
Methodological limitations	Are there any methodological weaknesses within individual studies that impact our confidence in the findings?	CERQual suggests assessing issues of recruitment, data collection and analysis; but leaves the criteria selection to review authors. As previously defined by Hall et al., 2019, we will follow identified 4 areas to assess: - recruitment methods - data collection methods - assessor influence - data analysis methods Based on these criteria each individual study's methodological rigour was determined to be: low, moderate or good. Threats were considered to be present if the study was assessed to be of low	None of the supporting data comes from studies with low methodological rigour	<25% of the supporting data comes from studies with low methodological rigour	25-50% of the supporting data comes from studies with low methodological rigour	>50% of the supporting data comes from studies with low methodological rigour

		methodological rigour.				
Coherence	How clear and cogent the fit is between the data from the primary studies and a review finding that synthesizes that data? By 'cogent', we mean well supported or compelling	- Contradictory data - Ambiguous or incomplete data - Competing theories	No threats present in the supporting data	Threats present in <25% of the supporting data	Threats present in 25-50% of the supporting data	Threats present in >50% of the supporting data
Adequacy	The degree of richness as well as the quantity of data supporting the review finding.	- *Data richness - descriptive findings*: superficial data is ok, - *Data richness - explanatory findings*: superficial data may lack sufficient quality to fully explore the phenomenon - *Data quantity:* one or very few studies or small studies may cause concern. This, however, should be taken into context of the review aim and question. If the finding is about a broad phenomenon or large	The supporting data is of sufficient richness and quantity.	The data comes from multiple studies in different settings and varying sample sizes and <25% of the supporting data is too superficial.	The data comes from only a few studies or small studies and 25-50% of the supporting data is too superficial.	The data comes from only a few studies or small studies and >50% of the supporting data is too superficial.

		variety of people have less confidence if it is based on small studies.				
Relevance	The extent to which the body of data from the primary studies is applicable to the context specified in the review question.	Relevance will be assessed in terms of the following elements of our review question: *Population:* Any URTI outlined in the Choosing Wisely Canada Guidelines: - Otitis Media - Pharyngitis - Sinusitis - The common cold - Bronchitis *Phenomenon of interest:* Family physicians' perspectives and experiences regarding evidence based antibiotic prescribing practices for URTIs. *Context:* Patients with URTIs in primary care settings.	The supporting data is of direct relevance to the review question.	Some of the supporting data (< 25%) is of indirect, partial or unclear relevance.	Some of the supporting data (25-50%) is of indirect, partial or unclear relevance.	The majority of the supporting data (>50%) is of indirect, partial or unclear relevance.
Note: Single study rule: for themes with data from a single study only, the following criteria was used to judge methodological limitation: If the study has moderate or low moderate methodological rigour, the confidence level was downgraded.						

* Reproduced from: Hall AM, Scurrey SR, Pike AE, Albury C, Richmond HL, Matthews J, 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.