



OPEN ACCESS

EDITED BY

Mohd Nasir Mohd Desa,
Putra Malaysia University, Malaysia

REVIEWED BY

Jennifer Hanrahan,
Eastern Virginia Medical School, United States
Mazen M. Jamil Alobaidi,
College of Applied Sciences, Rustaq, Oman

*CORRESPONDENCE

Stinne Glasdam
✉ stinne.glasdam@med.lu.se

RECEIVED 08 October 2024

ACCEPTED 17 December 2024

PUBLISHED 09 January 2025

CITATION

Balea LB, Gulestø RJA, Xu H and Glasdam S (2025) Physicians', pharmacists', and nurses' education of patients about antibiotic use and antimicrobial resistance in primary care settings: a qualitative systematic literature review.
Front. Antibiot. 3:1507868.
doi: 10.3389/frabi.2024.1507868

COPYRIGHT

© 2025 Balea, Gulestø, Xu and Glasdam. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Physicians', pharmacists', and nurses' education of patients about antibiotic use and antimicrobial resistance in primary care settings: a qualitative systematic literature review

Lavinia Bianca Balea¹, Ragnhild J. A. Gulestø², Hongxuan Xu^{3,4} and Stinne Glasdam^{4*}

¹Private, Bucharest, Romania, ²Department of Health Sciences, Institute of Nursing, VID Specialized University, Oslo, Norway, ³Department of Care Sciences, Faculty of Health and Society, Malmö University, Malmö, Sweden, ⁴Department of Health Sciences, Faculty of Medicine, Lund University, Lund, Sweden

Background: Patients' adherence to antibiotic treatment and related prevention of AMR is significant. Understanding healthcare professionals' strategies for advising and educating patients in primary care settings is crucial.

Aim: From the perspectives of professionals and patients, to explore how physicians, pharmacists, and nurses educate patients about antibiotic use and antimicrobial resistance in primary care settings.

Methods: A qualitative systematic literature review was conducted in MEDLINE, EMBASE, CINAHL Complete, Eric, SocINDEX, PsycInfo, Web of Science and Scopus. The study included 102 publications, followed PRISMA recommendations and was registered in PROSPERO (reg.no. CRD4202455761). The studies were screened and selected based on specific inclusion and exclusion criteria using Covidence. Quality appraisal followed the Critical Appraisal Skills Program (CASP) qualitative study checklist. Data were extracted, and the analysis consisted of a descriptive numerical summary analysis and a qualitative thematic analysis.

Results: The analyzed studies spanned multiple countries and settings and included perspectives of primary care physicians, pharmacists, nurses and patients. Two main themes emerged: (1) Relationships between professionals and patients influenced educational strategies, showing that trust and rapport between healthcare professionals and patients played a crucial role in shaping educational strategies around antibiotic use; (2) The organizational structures challenged professionals in guiding and educating patients, highlighting how limited resources, time constraints, and system-level pressures hindered healthcare professionals' ability to provide consistent and effective education. Often, structural challenges led to not educating the patients on the risks of antibiotic misuse and antimicrobial resistance. The use of delayed prescriptions emerged as a strategy for improved

AMR stewardship and to meet patients' expectations for antibiotic treatment, though it raised concerns about undermining professional responsibility and authority in ensuring appropriate antibiotic use.

Conclusion: Healthcare professionals' role in educating patients about antibiotic use and AMR in primary care settings was complex, with different challenges faced by nurses, pharmacists and primary care physicians. These challenges extended beyond the clinical level, including relational, social and structural factors. Power dynamics, trust issues, and time pressures often hindered effective education on antibiotic use. Addressing gaps in education on antibiotic use and AMR requires acknowledging these multifaceted challenges, with future efforts focusing on better supporting healthcare professionals in this context.

Systematic review registration: <https://www.crd.york.ac.uk/prospero/>, identifier CRD4202455761.

KEYWORDS

antimicrobial resistance, patient education, primary care, professionals, qualitative systematic literature review

Introduction

According to the World Health Organization (WHO, 2017), antimicrobial resistance (AMR) occurs when bacterial, viral, parasitic, and fungal microorganisms develop resistance to antimicrobial medicines. AMR is a significant contemporary social issue and a global priority for policymakers (Andersson et al., 2019; Center for Disease Dynamics, Economics & Policy, 2015; World Health Organization, 2015). In 2019, AMR was associated with 4.95 million deaths and directly attributable to 1.27 million deaths (Antimicrobial Resistance Collaborators, 2022). If unaddressed, the burden of the AMR-related disease is projected to reach 10 million deaths annually by 2050. A major driver of AMR is the misuse and overuse of antibiotics, particularly in primary care, which accounts for over 80% of antibiotic use worldwide (Wang et al., 2021). Thus, decreasing the inappropriate use of antibiotics in primary care is crucial to tackling AMR (Heyman et al., 2014).

Primary care physicians, pharmacists, and nurses are on the front lines of managing antibiotic use and advising patients on the prevention of AMR in primary care settings (Alves et al., 2021; Burnett, 2018; Sumner et al., 2018; Wong et al., 2021). Proper education regarding antibiotic use may ensure that patients understand the importance of rational antibiotic therapy, which is essential for reducing the risk of resistance (Korkmaz et al., 2024; Lambert et al., 2024; Rao et al., 2020). However, a survey-based study reveals that although 67% of patients received advice about their infection, only 8% recalled being informed about antibiotic resistance (McNulty et al., 2016). This significant gap highlights the need for improved education and communication strategies provided by healthcare professionals regarding both the proper use of antibiotics

and the implications of AMR. A key prerequisite for addressing the gap is ensuring that healthcare professionals possess adequate knowledge regarding the appropriate use of antibiotics (Lalithabai et al., 2022; Lim et al., 2022; Ness et al., 2014). Research indicates that effective patient education and guidance from healthcare professionals play a crucial role in supporting antimicrobial stewardship. This involves strategies aimed at optimizing antibiotic use to prevent resistance (Ha et al., 2017; Miller et al., 2020). For instance, informing patients about the potential side effects of antibiotics and how to manage them can improve treatment compliance and health outcomes (Nieuwlaat et al., 2014). A recent review highlights that public health campaigns utilizing mass media for information dissemination, along with targeted messaging about specific infections and interactions between healthcare professionals and patients, can effectively improve public awareness of AMR and influence patients' behavior regarding antibiotic use (Gilham et al., 2024).

Non-adherence to antibiotic treatment remains a critical challenge. Several factors influence patients' adherence, including their knowledge of antibiotics and AMR, past experiences with infections and treatments, attitudes towards antibiotics use, as well as considerations like time and financial resources. Additionally, trust in prescribed treatment regimens and the level of social support they receive also play crucial roles in their adherence to treatment (Gualano et al., 2015; Lee et al., 2023; McCubbin et al., 2021; Pristianty et al., 2019). Responsible antibiotic use is determined not only by patient-related factors but also by a complex interplay of external influences at different levels, such as healthcare professionals' practices, societal norms, healthcare guidelines or policies, and public health initiatives (Schmiege et al., 2020; Sievert et al., 2024). In primary care settings,

physicians play a pivotal role in antibiotic prescriptions. However, they often face challenges stemming from limited knowledge or misconceptions about antibiotic use. Additionally, patient expectations and external influences, such as pharmaceutical marketing, can contribute to the overprescription of antibiotics, ultimately leading to antibiotic misuse and AMR (Md Rezal et al., 2015; Sievert et al., 2024; Sulis et al., 2020). While pharmacists and nurses are crucial in promoting antibiotic stewardship, their ability to influence prescriptions is limited once antibiotics are prescribed. This highlights the need for improved collaboration and continuous education across all healthcare professionals in primary care settings (Lim et al., 2022; Ness et al., 2014). Given that primary care's nature and mission are to provide accessible, comprehensive, and preventive care, primary healthcare professionals are often the first point of contact for patients seeking medical care, providing them a critical position as gatekeepers to influence the appropriate use of antibiotics and reduce the occurrence of AMR (Sjibom et al., 2023; World Health Organization, 2018).

Despite these critical issues within primary care settings, existing literature primarily focuses on hospital settings or patients behaviors (Camerini et al., 2024; Giamarellou et al., 2023; Rachina et al., 2024), leaving the practices and educational strategies in primary care largely unexplored. Given the significant impact of patients' non-adherence to antibiotic treatment and prevention of AMR, understanding the specific educational roles and strategies of healthcare professionals in primary care settings is crucial. Therefore, from the perspectives of both professionals and patients, the study aimed to explore how physicians, pharmacists, and nurses educate patients about antibiotic use and AMR in primary care settings.

Method

This study carried out a qualitative systematic review to synthesize findings from various qualitative research studies. The method was inspired by Bettany-Saltikov and McSherry (2016). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, ensuring transparency, rigor, and consistency in the systematic review

process (Page et al., 2021). The review protocol is registered with PROSPERO (registration number CRD4202455761).

Inclusion and exclusion criteria

Inclusion and exclusion criteria were established based on the PEO model (Table 1). The PEO model was chosen as it provided a structured approach to framing research questions and organizing data that aligns well with qualitative methodologies (Bettany-Saltikov and McSherry, 2016; Khan et al., 2004). The inclusion criteria were: 1) Primary care physicians (e.g., GPs, surgeons, and pediatricians), pharmacists, and nurses, working in primary healthcare settings or community care advising, 2) Perspectives of patients/citizens and primary care physicians, pharmacists, and nurses, 3) Qualitative studies or qualitative sub-studies in mixed method studies, 4) Published between 2014 to 2024, to reflect the most current evidence related to antibiotic stewardship, and 5) Published in English, Scandinavian or Romanian. The review excluded: 1) Systematic literature reviews, 2) Intervention studies, 3) Studies about vaccination, 4) Editorials/comments, 5) Dental care, 6) Guidelines/recommendations, and 7) Simulation studies.

Searching, selection, appraising, and extraction relevant data

A qualitative systematic literature review was conducted in MEDLINE, EMBASE, CINAHL Complete, Eric, SocINDEX, PsycInfo, and Web of Science (Last search 8 July 2024), supported by an experienced librarian. The initial search retrieved 9948 publications, which were transferred to Covidence software for screening. The search strategies are presented in Table 2. To identify additional relevant studies, a citation pearl search was conducted in the Scopus database (Last search 1 August 2024).

Two of the authors (LBB and SG) collaborated on the study selection process. In cases of disagreement during the screening, full-text review, or citation search processes, discussions were held with the other authors (RJAG and HX) until a consensus was reached. A PRISMA flow diagram illustrates the study selection

TABLE 1 Populations, Exposures, and Outcomes (PEO).

| Block | Population (P) | Exposure (E) | Outcome/Theme (O) |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Block 1 | General Practitioners, Pharmacists, Nurses, Patients, Healthcare Workers | Advising and educating patients about antibiotic use, AMR, interventions, programs, strategies | Improvement in patients' knowledge, antibiotic use adherence, increased awareness about AMR, patient involvement |
| Block 2 | "general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*" OR "health care worker*" OR "healthcare worker*" OR "medical staff" OR "community health workers" OR "community nurse*" OR "community pharmacist*" OR "primary care" OR "primary healthcare" OR "community care" OR "community healthcare" OR patient* OR "health personnel" | antibiotic* OR antibiotics OR antimicrobial* OR "antibiotic use" OR "antibiotic adherence" OR AMR OR "antimicrobial resistance" OR "community pharmacist*" OR "infection prevention and control measure*" OR "AMR awareness campaign*" OR educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making" | "improvement in knowledge" OR adherence OR "antibiotic use adherence" OR "AMR awareness" OR "patient awareness" OR "knowledge" OR "patient involvement" OR interaction* OR communication OR "decision-making" OR "infection prevention" OR stewardship OR "patient participation" |

* is used as a wildcard character to represent one or more characters in a search term.

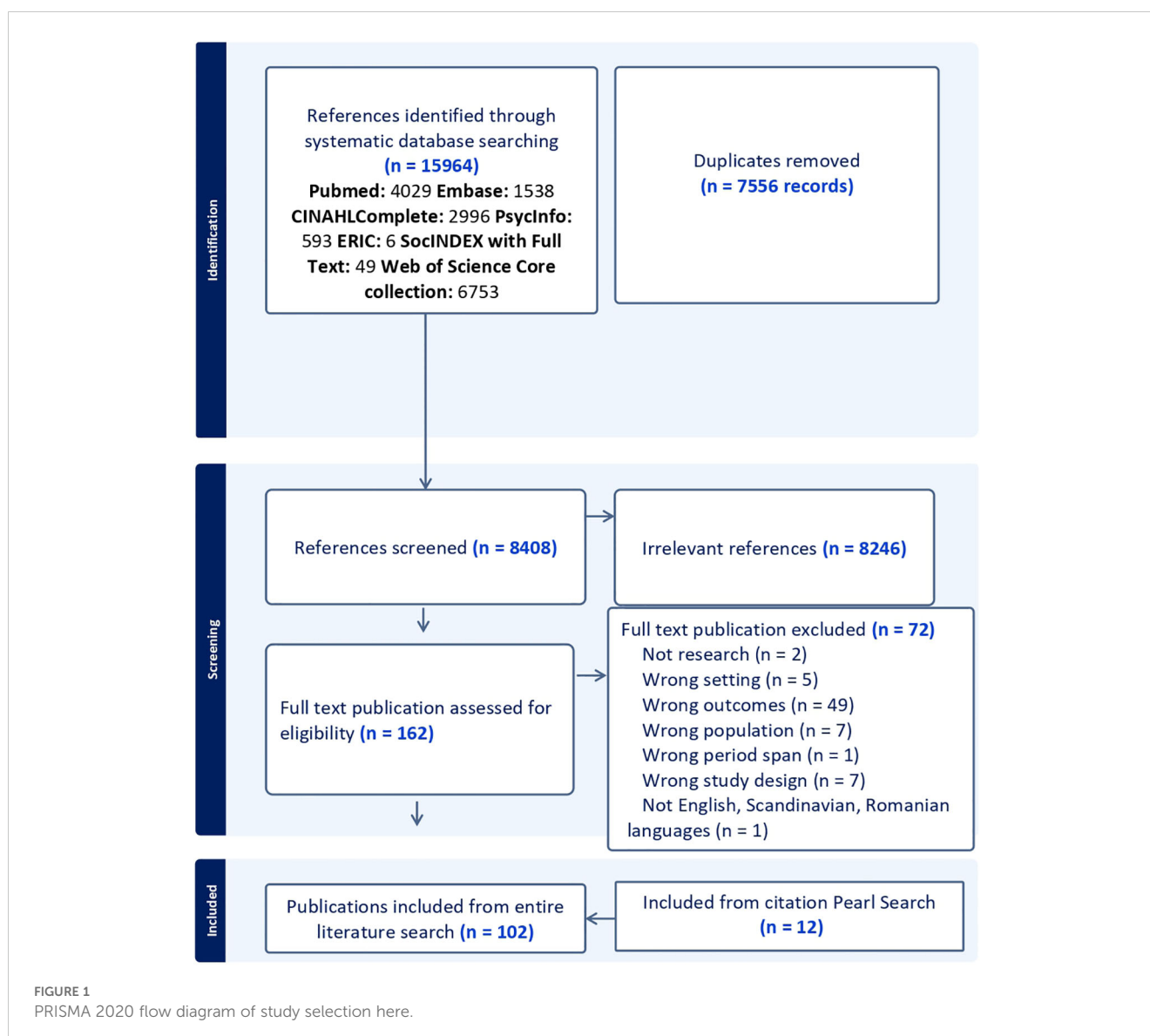
TABLE 2 The full electronic search strategy for all three databases.

| Database | Search String |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>PubMed (National Library of Medicine) Limiters >Language: Danish, English, Norwegian, Romanian, Swedish Published Date: 2014 - 2024 Date of search: 2024/06/12 Hits: 4029 records</p> | <p>#1 "general practitioner"[Title/Abstract] OR physician*[Title/Abstract] OR doctor*[Title/Abstract] OR pharmacist*[Title/Abstract] OR nurse*[Title/Abstract] OR "nursing staff"[Title/Abstract] OR "health professional"[Title/Abstract] =1033951 records #2 (antibiotic*[Title/Abstract] OR antibiotics[Title/Abstract] OR antimicrobial[Title/Abstract] OR "community pharmac*" [Title/Abstract]) AND (educat*[Title/Abstract] OR intervent*[Title/Abstract] OR program*[Title/Abstract] OR knowledge[Title/Abstract] OR practice[Title/Abstract] OR communicat*[Title/Abstract] OR strateg*[Title/Abstract] OR behav*[Title/Abstract] OR stewardship[Title/Abstract] OR "decision-making") =140421 records #3 "infection prevention and control measure*" OR "AMR awareness campaign*" =512 records #4 #2 OR #3 =140857 records #5 #1 AND #4 =17601 records #6 primary care[Title/Abstract] OR primary healthcare[Title/Abstract] OR community care[Title/Abstract] OR community healthcare[Title/Abstract] OR community nurse*[Title/Abstract] OR community pharmacist*[Title/Abstract] =174252 records #7 "Primary Health Care"[Mesh] =197855 records #8 #6 OR #7 =306271 records #9 #5 AND #8 =5856 records #8 #7 Filters: Danish, English, Norwegian, Romanian, Swedish, from 2014 - 2024 =4029 records</p> |
| <p>Embase.com (Elsevier, 1947-present) Date of search: 2024/06/12 Hits: 1538 records</p> | <p>#1 'general practitioner':ti,ab,kw OR physician*:ti,ab,kw OR doctor*:ti,ab,kw OR pharmacist*:ti,ab,kw OR nurse*:ti,ab,kw OR 'nursing staff':ti,ab,kw OR 'health professional':ti,ab,kw =1436757 records #2 (antibiotic*:ti,ab,kw OR antibiotics:ti,ab,kw OR antimicrobial:ti,ab,kw OR 'community pharmac*':ti,ab,kw) AND (educat*:ti,ab,kw OR intervent*:ti,ab,kw OR program*:ti,ab,kw OR knowledge:ti,ab,kw OR practice:ti,ab,kw OR communicat*:ti,ab,kw OR strateg*:ti,ab,kw OR behav*:ti,ab,kw OR stewardship:ti,ab,kw OR 'decision-making':ti,ab,kw) =198528 records #3 'infection prevention and control measure*' OR 'amr awareness campaign*' =598 records #4 #2 OR #3 =199030 records #5 #1 AND #4 =31163 records #6 'primary health care'/exp OR 'primary care':ti,ab,kw OR 'primary healthcare':ti,ab,kw OR 'community care':ti,ab,kw OR 'community healthcare':ti,ab,kw OR 'community nurse*':ti,ab,kw OR 'community pharmacist*':ti,ab,kw =314354 records #7 #5 AND #6 =9730 records #8 #7 AND (2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py OR 2024:py) AND [embase]/lim NOT (([embase]/lim AND [medline]/lim) =3729 records #9 #7 AND (2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py OR 2024:py) AND [embase]/lim NOT (([embase]/lim AND [medline]/lim) AND (([danish]/lim OR [english]/lim OR [norwegian]/lim OR [romanian]/lim OR [swedish]/lim) =3627 records #10 #9 AND 'conference abstract'/it =2089 records #11 #9 NOT #10 =1538 records</p> |
| <p>CINAHLComplete (Cumulative Index to Nursing and Allied Health Literature; EbscoHost, inception to present) Date of search: 2024/06/13 Limiters Publication Date: 2014/01/01-2024/12/31 Language: English Hits: 2996 records</p> | <p>#1 TI ("general practitioner" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") OR AB ("general practitioner" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") =633047 records #2 TI (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") OR AB (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") =83901 records #3 TI (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") OR AB (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") =2134431 records #4 #2 AND #3 =27467 records #5 "infection prevention and control measure*" OR "AMR awareness campaign*" =190 records #6 (MH "Prescriptions, Drug+") AND TI (antibiotic OR antibiotics) =709 records #7 #4 OR #5 OR #6 =27937 records #8 #1 AND #7 =7202 records #9 (MM "Primary Health Care") OR TI (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) OR AB (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) =271695 records #10 #8 AND #9 =3981 records #11 #10 Limiters - Publication Date: 20140101-20241231 Narrow by Language: - English =2996 records</p> |
| <p>PsycInfo (EbscoHost, inception to present) Date of search: 2024/06/13 Limiters Publication Year: 2014-2024 Language: English Hits: 593 records</p> | <p>#1 TI ("general practitioner" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") OR AB ("general practitioner" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") =224732 records #2 TI ((antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") OR AB ((antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") =5225 records #3 TI (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") OR AB (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") =2808907 records #4 #2 AND #3 =2995 records</p> |

(Continued)

TABLE 2 Continued

| Database | Search String |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>#5 "infection prevention and control measure*" OR "AMR awareness campaign*" =14 records #6 #4 OR #5 =3008 records #7 #1 AND #6 =1286 records #8 MM "Primary Health Care" OR TI (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) OR AB (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) =127385 records #8 #7 AND #8 =934 records #9 #8 Limiters - Publication Year: 2014-2024 Narrow by Language: - English =593 records</p> |
| <p>ERIC (Ebsco Host) Date of search: 2024/06/13 Limiters Published Date: 2014/01/01-2022/12/31 Hits: 6 records</p> | <p>#1 TI ("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") OR AB ("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") =35777 records #2 TI (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") OR AB (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") =292 records #3 TI (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") OR AB (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") =1362491 records #4 #2 AND #3 =171 records #5 TI ("infection prevention and control measure*" OR "AMR awareness campaign*") OR AB ("infection prevention and control measure*" OR "AMR awareness campaign*") =1 records #6 #4 OR #5 =172 records #7 #1 AND #6 =49 records #8 TI (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) OR AB (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) =16472 records #9 #7 AND #8 =35 records #10 #9 Limiters - Published Date: 20140101-20221231 =6 records</p> |
| <p>SocINDEX with Full Text (EBSCOhost) Date of search: 2024/06/13 Limiters Publication Date: 2014/01/01-2024/12/31 Hits: 49 records</p> | <p>#1 TI ("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") OR AB ("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") =71527 records #2 TI (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") OR AB (antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*") =3044 records #3 TI (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") OR AB (educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") =1074444 records #4 #2 OR #3 =1027 records #5 "infection prevention and control measure*" OR "AMR awareness campaign*" =4 records #6 #4 OR #5 =1031 records #7 #1 AND #6 =410 records #8 TI (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) OR AB (primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) =39152 records #9 #7 AND #8 =226 records #10 #9 Limiters - Publication Date: 20140101-20241231 =49 records</p> |
| <p>Web of Science Core collection (Clarivate Analytics) Date of search:2024/06/14 Limiters Publication Years: 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 or 2022 or 2023 or 2024; Document Types: Article or Review Article Languages: English Hits: 6753 records</p> | <p>#1 AB=(("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*")) =721288 records #2 TI=("general practitioner*" OR physician* OR doctor* OR pharmacist* OR nurse* OR "nursing staff" OR "health professional*") =291411 records #3 #1 OR #2 =881268 records #4 (TS=(antibiotic* OR antibiotics OR antimicrobial OR "community pharmac*")) AND TS=(educat* OR intervent* OR program* OR knowledge OR practice OR communicat* OR strateg* OR behav* OR stewardship OR "decision-making") =174354 records #5 ALL=(("infection prevention and control measure*" OR "AMR awareness campaign*")) =472 records #6 #4 OR #5 =174745 records #7 #3 AND #6 =17831 records #8 TS=(primary care OR primary healthcare OR community care OR community healthcare OR community nurse* OR community pharmacist*) =579837 records #9 #7 AND #8 =9985 records #10 #9 and 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 or 2022 or 2023 or 2024 (Publication Years) and Article or Review Article (Document Types) and English (Languages) =6753 records</p> |



process (Figure 1). As a second opinion, RJAG reviewed all the included articles in relation to the inclusion and exclusion criteria, which supported the selection. The 102 included publications are marked with an asterisk (*) in the reference list.

The quality of the included publications was assessed using the Critical Appraisal Skills Program (CASP) qualitative study checklist (Critical Appraisal Skills Program, 2018). The use of the CASP qualitative study checklist provided a systematic method for assessing the quality of included publications, demonstrating a commitment to methodological rigor and ensuring the review's findings were grounded in credible, high-quality evidence. The use of the checklist was endorsed by the Cochrane Qualitative and Implementation Methods Group (Long et al., 2020). This checklist consists of ten questions evaluating various aspects of the studies, including their aim, methodology and design, recruitment strategy, data collection, data analysis, findings, and overall research value (see Table 3). The purpose of the quality appraisal was to ensure the strength of the evidence in addressing our research question.

Strategy for data analysis

The data analysis strategy included a descriptive numerical summary analysis, presented as 'Characteristics of the Studies', and an inductive thematic analysis inspired by Braun and Clarke (2006).

First, the publications were read multiple times, facilitating familiarization with the material (Braun and Clarke, 2006). The following data were extracted: 1) Authors, 2) Location, 3) Journal, 4) Study period, 5) Study design, 6) Sample size, 7) Target group and context, 8) Theory/concepts, 9) Results, and 10) Limitations. Data extraction focused on the qualitative findings relevant to the review aim (Bettany-Saltikov and McSherry, 2016). The included studies represent diverse contexts and countries, each with unique cultural and healthcare system characteristics. To manage this heterogeneity, we focused on extracting data that was applicable across various settings while noting contextual differences. All authors checked the extracted data for accuracy. A selection of this data extraction is presented in Table 4.

TABLE 3 Qualitative study appraisal*.

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Alhomoud et al., 2018 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Alkadhimi et al., 2020 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Alkirawan et al., 2022 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Alzard et al., 2024 | Yes | Yes | Yes | Yes | Yes | Cannot tel | Yes | Yes | Yes | Yes | 9/10 |
| Amin et al., 2017 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Anderson et al., 2019 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Aponte-González et al., 2019 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Arnau-Sánchez et al., 2023 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Ashdown et al., 2021 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Atif et al., 2020 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Bergsholm et al., 2023a | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Bergsholm et al., 2023b | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Biezen et al., 2017 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Biezen et al., 2019 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Bisgaard et al., 2021 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Black et al., 2014 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Bless et al., 2016 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Boaitey et al., 2023 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Boiko et al., 2020 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|---------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Bordado Sköld, et al, 2017 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Bosley et al., 2021 | Yes | Yes | Cannot tell | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 8/10 |
| Brisley et al., 2023 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Cannot tell | Yes | Yes | 8/10 |
| Brookes-Howell et al., 2014 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Cabral, C., Ingram, J., Hay, A.D. & Horwood, J., 2014 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Cabral et al., 2016 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Colliers et al., 2018 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Colliers et al., 2020 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Courtenay et al., 2017 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Courtenay et al., 2019 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Cox et al., 2023 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Dallas et al., 2020 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Darj et al., 2019 | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Dempsey et al., 2014 | | | | | | | | | | | |
| Duane et al., 2016 (Ireland) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Durand et al., 2022 (France) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Essilini et al., 2021 (France) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|----------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Fletcher-Lartey et al., 2016 (Australia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Gaarslev et al., 2016 (Australia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Gautham et al., 2024 (India) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Ghiga and Stålsby Lundborg, 2016 (Romania) | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | Yes | Yes | 9/10 |
| Ghiga et al., 2023 (Romania) | Yes | Yes | Yes | No | Yes | Cannot tell | Yes | Cannot tell | Yes | Yes | 8/10 |
| Grigoryan et al., 2022 (United States and Germany) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Guo et al., 2021 (Singapore) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Halls et al., 2017 (United Kingdom) | Yes | Yes | Yes | No | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Hika et al., 2022 (New Zealand) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Hoang et al., 2024 (Vietnam) | Yes | Yes | Yes | No | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Horwood et al., 2016 (United Kingdom) | Yes | Yes | Yes | No | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Hu et al., 2024 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Jakupi et al., 2019 (Kosovo) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|--------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Jones et al., 2018 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Kaminsky et al., 2020 (Sweden) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Khan et al., 2021 (Pakistan) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Khan et al., 2022 (Pakistan) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Knobloch et al., 2021 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Kurotschka et al., 2024 (Germany) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Laytner et al., 2023 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Lescure et al., 2022 (The Netherlands) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Lipstein et al., 2019 (United States of America) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Lum et al., 2017 (Australia) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Lum et al., 2018 (Australia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Mahmoud et al., 2018 (Saudi Arabia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Manderson, L., 2020 (South Africa) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Mas-Dalmau et al., 2023 (Spain) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| McDermott, L., Leydon, G. M., Halls, A., Kelly, J., Nagle, A., White, J. & Little, P., 2017 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Medina-Perucha et al., 2020 (Spain) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Mortazhejri et al., 2020 (Canada) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Musoke et al., 2023 (Uganda) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Mustafa et al., 2014 (United Kingdoms) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| O'Doherty et al., 2019 (Ireland) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Om et al., 2017 (Cambodia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Özcebe et al., 2022 (Turkey, Germany, Sweden and the Netherlands) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Peiffer-Smadja et al., 2020 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Poss-Doering et al., 2020 (Germany) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|-------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Raspopovic et al., 2016 (Montenegro) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Res et al., 2017 (Australia) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Ryves et al., 2016 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Saleem et al., 2019 (Pakistan) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Saliba-Gustafsson et al., 2021 (Malta) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Saliba-Gustafsson et al., 2019 (Malta) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Salim and Elgizoli, 2017 (Sudan) | | | | | | | | | | | |
| Sargent et al., 2017 (Australia) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Sayood et al., 2021 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Sharaf et al., 2021 (Qatar) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Simeoni et al., 2022 (Canada) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Souto-López et al., 2020 (Spain) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Spicer et al., 2020, (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|---------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | |
| Stivers and Timmermans, 2021 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Sundvall et al., 2020 (Sweden) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Suy et al., 2019 (Cambodia) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Sychareun et al., 2022 (Lao PDR) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Thaggard et al., 2023 (New Zealand) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| Tonna et al., 2020 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Torres et al., 2020 (Mozambique) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Torres et al., 2023 (Mozambique) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| van der Zande et al., 2019 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| van Hecke et al., 2019a (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| van Hecke et al., 2019b (South Africa) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 10/10 |
| van Horrik et al., 2024 (The Netherlands) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |
| Williams et al., 2018 (United Kingdom) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 |

(Continued)

TABLE 3 Continued

| Author(s), years | Section A: Are the results valid? | | | | | | | | Section B: What are the results? | | | Section C: Will the results help locally? | Scores |
|-----------------------------------------------|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-----------------------------------|------|-------------------------------------------|--------|
| | 1. Was there a clear statement of the aims of the research? | 2. Is a qualitative methodology appropriate? | 3. Was the research design appropriate to address the aims of the research? | 4. Was the recruitment strategy appropriate to the aims of the research? | 5. Was the data collected in a way that addressed the research issue? | 6. Has the relationship between researcher and participants been adequately considered? | 7. Have ethical issues been taken into consideration? | 8. Was the data analysis sufficiently rigorous? | 9. Is there a clear statement of findings? | 10. How valuable is the research? | 9/10 | | |
| Yates et al., 2018 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 | | |
| Zago et al., 2023 (Brazil) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 | | |
| Zetts et al., 2020 (United States of America) | Yes | Yes | Yes | Yes | Yes | Cannot tell | Yes | Yes | Yes | Yes | 9/10 | | |

Conducted in accordance with CASP Qualitative study checklist (Critical Appraisal Skills Programme, 2018).

The results sections of the publications were coded, and these codes were reorganized to align with the review’s aim (Braun and Clarke, 2006). Initial themes were constructed from the coded material based on similarities and differences. Similar codes were grouped into themes. The themes were reviewed and further developed through a consensual process among the authors, iterating between the constructed themes, the empirical data, and the research question to ensure the themes accurately reflected the empirical material (Braun and Clarke, 2006). Finally, each main theme and sub-theme were defined, refined, named, and reviewed to ensure they were concise and adequately descriptive (Braun and Clarke, 2006). The (sub)themes were narratively described to achieve the study’s aim. For practical reasons, we refer to all non-professional actors as patients. However, we recognize that many participants are not current patients but citizens representing former or potential patients, clients, parents, or others.

Results

Characteristics of the studies

In total, 102 publications were included, all published in English (see Table 4 for details). Of these, 14 publications primarily focused on primary care physicians’, pharmacists’, and nurses’ education of patients about antibiotic use and antimicrobial resistance in primary care settings (Alzard et al., 2024; Atif et al., 2020; Bergsholm et al., 2023a, 2023b; Cabral et al., 2014, 2016; Durand et al., 2022; Essilini et al., 2021; Ghiga and Stålsby Lundborg, 2016; Hu et al., 2024; Knobloch et al., 2021; Manderson, 2020; Musoke et al., 2023; Peiffer-Smadja et al., 2020). The remaining 88 publications addressed primary care physicians’, pharmacists’, and nurses’ education of patients about antibiotic use and antimicrobial resistance in primary care settings as a secondary focus.

The studies were conducted in 38 different countries across all populated continents: the United Kingdom (n=21), Australia (n=11), the USA (n=10), Spain (n=6), the Netherlands (n=5), Pakistan (n=4), Germany (n=4), Sweden (n=3), and Norway (n=3). Additionally, 13 other countries each contributed two publications, and 17 countries were represented by one publication each. Three studies were conducted across multiple countries (Brookes-Howell et al., 2014; Grigoryan et al., 2022; Özcebe et al., 2022).

A majority of the publications (n = 66) used individual semi-structured interviews as a data collection method, conducted either face-to-face or through video/telephone. Eleven publications used focus groups as the only data collection method, one study collected reports/documents as empirical material, and one publication used observations. Fourteen publications combined qualitative methods such as observations, video recordings, documents, and individual and/or focus group interviews. Mixed methods using different quantitative and qualitative data collection methods were used in nine publications.

The studies were all published between 2014 and 2024 and conducted between 2010 and 2022. One study, Stivers and

TABLE 4 Study characteristics.

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Alhomoud et al., 2018 (Saudi Arabia) | BMC Health Service Research (2023: 7,0) | To explore reasons for non-prescribed sale of antibiotics from the pharmacists' perspectives in Saudi Arabia | Semi-structured interviews; 20 pharmacists; Community pharmacies in Eastern Province of Saudi Arabia | January-May 2017 |
| Alkadhimi et al., 2020 (Iraq) | Pharmacy Practice (2023: 2,4) | To explore the dispensing practice of antibiotics in community pharmacies in addition to understanding the community pharmacists' perceptions about dispensing antibiotics without prescription | Semi-structured interviews; 20 pharmacists; Community pharmacies in Baghdad | February 2020 |
| Alkirawan et al., 2022 (The Netherlands) | International Journal of Migration, Health & Social Care (2023: 0,7) | To explore the perspectives and expectations of Syrian refugees in The Netherlands about antibiotic use and prescribing in Dutch primary care | Semi-structured interviews; 12 Syrian refugees; primary care | N/A |
| Alzard et al., 2024 (Australia) | Journal of the Pediatric Infectious Diseases Society (2023: 2,5) | To explore community pharmacists' and parents' experiences, opinions, and knowledge regarding antibiotic use in children and the role of CPs in advocating for antimicrobial stewardship | Semi-structured interviews; 47 pharmacists and 46 parents/ caregivers of young patients; Community pharmacies in Melbourne | N/A |
| Amin et al., 2017 (Egypt) | International Journal of Clinical Pharmacy (2023: 2,6) | To examine factors associated with the unwarranted dispensing of subtherapeutic doses of antibiotics in community pharmacies as part of a cold group or upon direct request from patients among community pharmacy staff | Semi-structured interviews; 9 pharmacists and 6 pharmacy assistants; Community pharmacies in Alexandria | April- December 2016 |
| Anderson et al., 2019 (United Kingdom) | BMJ Paediatrics Open (2023: 2,0) | To assess clinicians' perspectives on the EEPRIIS surveillance information intervention, in order to inform its design (content and delivery) | Semi-structured interviews; 18 GPs and 3 nurse practitioners; urban general practitioner surgeries in a South-West of England city | February-July 2016 |
| Aponte-González et al., 2019 (Colombia) | Pharmacy Practice (2023: 2,4) | To explore the attitudes and motivations associated with the use of antibiotics without prescription | Four focus group interviews; 21 adult people; Bogota | June - July 2016 |
| Arnau-Sánchez et al., 2023 (Spain) | Antibiotics (2023: 4,3) | To explore factors influencing inappropriate use of antibiotics in early infancy from the perspective of the primary care paediatrician | Focus group discussions (FGDs); 25 paediatricians; nine health care areas of the public health care system of the Region of Murcia, Spain | November 2021 |
| Ashdown et al., 2021 (United Kingdom) | BMJ Open (2023: 2,4) | To investigate what factors influence GPs' decisions in the management of at-risk children with influenza-like illness, particularly in relation to antibiotic prescribing decisions | Semi-structured telephone interviews; 41 GPs; General practices in England | March 2013 - March 2014 |
| Atif et al., 2020 (Pakistan) | Journal of Infection and Public Health (2023: 4,7) | To assess the community pharmacists' knowledge, perceptions and current practices regarding Antibiotic Stewardship Program | Semi-structured interviews; 15 pharmacists; Community pharmacies in the Bahawalpur district of the Punjab province | October - November 2018 |
| Bergsholm et al., 2023a (Norway) | Exploratory Research in Clinical and Social Pharmacy (2023: 1,8) | To explore how knowledge of antibiotic use is collected and communicated between patients, GPs, and pharmacists, and how patients seek, understand and use available information on antibiotics in adherence to prescribed treatment | Seven focus group interviews; 11 pharmacists (three groups), 13 unspecified physicians and GPs (two groups), and 8 patients (two groups); Norway | October 2020 - January 2021 |
| Bergsholm et al., 2023b (Norway) | Journal of Interprofessional Care (2022: 2,7) | To investigate how pharmacists, GPs and patients position pharmacists in their interactions with patients on antibiotic-related matters in Norwegian pharmacies | Seven focus group interviews; 11 pharmacists (three groups), 13 unspecified physicians and GPs (two groups), and 8 patients (two groups); Norway | October 2020 - January 2021 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Biezen et al., 2017 (Australia) | NPJ Primary Care Respiratory Medicine (2023: 3,1) | To explore the views, attitude and practices of primary care providers in the management of RTIs in young children | Semi-structured interviews; 20 GPs, 2 practice nurses, 3 maternal child health nurses and 5 pharmacists; Primary care setting | June 2014 - January 2015 |
| Biezen et al., 2019 (Australia) | BMC Family Practice (2023: 3,2) | To compare GPs and parents' views on antibiotics for RTIs in young children, exploring barriers and contrasting views | Mix methods - Survey, semi-structured interviews and five focus group interviews; 20 GPs (interviews), and 50 parents and carers of children under the age of five (focus groups); Melbourne | June 2014 - July 2015 |
| Bisgaard et al., 2021 (Denmark) | Antibiotics (Basel) (2023: 4,3) | To explore GPs' considerations and experiences when managing patients with symptoms of acute lower respiratory tract infections | Semi-structured interviews; 7 GPs; urban and rural locations in the North Denmark Region | January - March 2020 |
| Black et al., 2014 (Qatar) | International Journal of Clinical Pharmacy (2023: 2,6) | To assess pharmacists' opinions relating to antibiotic utilisation in the community setting | 3 focus groups and 2 small group interviews; 22 pharmacists; Community pharmacies and primary care | N/A |
| Bless et al., 2016 (Switzerland) | PLoS One (2023: 2,9) | To investigate how acute gastroenteritis (AG) and campylobacteriosis are managed, to evaluate how patient's health-seeking behaviour and GPs' clinical decision-making impact surveillance data and to gather data on the incidence of AG and campylobacteriosis in primary care settings | Semi-structured interviews; 69 GPs; GP practices | May-August 2013 |
| Boaitey et al., 2023 (Australia) | Australian Journal of Primary Health (2023: 1,2) | To explore GPs' awareness and views about using natural history information when consulting about self-limiting infections, and GPs perceptions and use of the antibiotic chapter resources | Semi-structured interviews; 21 GPs; GP practices on the Gold Coast and Brisbane | September 2021 - April 2022 |
| Boiko et al., 2020 (United Kingdom) | BMJ Open (2023: 2,4) | To investigate how primary care prescribers perceive risk and safety concerns associated with reduced antibiotic prescribing | Semi-structured interviews; 23 GPs, 5 nurse (with prescription certificate), 2 pharmacists; 10 general practices in an urban area and a shire town | January - July 2019 |
| Bordado Sköld et al., 2017 (Denmark) | European Journal of General Practice (2022: 3,4) | To explore (i) GPs' views of antibiotic treatment failure (ATF) in primary care; (ii) how ATF influences the doctor-patient relationship; and (iii) GPs' understanding of patients' views of ATF | Semi-structured interviews; 18 GPs; GP practices in Copenhagen area and Zealand region | August - October 2012 |
| Bosley et al., 2021 (United Kingdom) | Contemporary Nurse (2022: 1,6) | To explore antibiotic prescribing and factors which may influence maternal decision making to seek antibiotics for their young children | Mixed-methods case study consisting of quantitative descriptions of antibiotic prescribing data from general practices and six focus groups; 19 mothers of children under five (focus group interviews); a large UK city in Southern England | Quantitative study: July 2016–2017 Focus group interviews: N/A |
| Brisley et al., 2023 (Spain) | Medical Anthropology (2022: 2,3) | To explore the prescription and use of antibiotics in Catalonia from the perspective of GPs, residents of Barcelona, and professionals working on antibiotic stewardship | Ethnographic fieldwork and semi-structured interviews; political documents, 4 GPs, 1 clinical researcher, 1, director of pharmacy, 3 residents of Barcelona (interviews); Barcelona | 2018 - 2019 |
| Brookes-Howell et al., 2014 (Poland, United Kingdom, Norway, Spain) | Family Practice (2022: 2,4) | To achieve a deeper understanding of parents' acceptance, or otherwise, of clinicians' antibiotic prescribing decisions for children with respiratory tract infections | Semi-structured interviews; 63 parents; primary care settings in the cities of Łódź (n = 16), Cardiff (n = 15), Tromsø (n = 12) and Barcelona (n = 20) | June 2008 - April 2009 |
| Cabral, C., Ingram, J., Hay, A.D. & Horwood, J., 2014 (United Kingdom) | Patient Education and Counseling (2023: 2,9) | To investigate parents' experiences and views of clinician communication during primary care consultations for respiratory tract infections in children under 12 | Semi-structured interviews; 30 parents of children who had recently consulted for respiratory tract infections; participants' homes across the UK | February-August 2011 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|-------------------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Cabral et al., 2016 (United Kingdom) | Annals of Family Medicine (2022: 5.7) | To understand clinicians' and parents' perceptions of communication within consultations for respiratory tract infections in children and what influence clinician communication had on parents' understanding of antibiotic treatment | 60 video recorded consultations and video-elicitation semi-structured interviews; 27 parents and 13 clinicians (9 general practitioners; 3 nurse prescribers; 1 physician assistant) of children aged 3 months to 12 years who presented with RTI; primary care in southwest England | May-December 2013 |
| Colliers et al., 2018 (Belgium) | BMJ Open (2023: 2,4) | To assess antibiotic prescribing and dispensing challenges for GPs and pharmacists in out-of-hours primary care, and to identify context-specific elements that can improve AB prescribing in this setting | Semi-structured interviews; 17 GPs, 1 manager, and 5 pharmacists; a Belgian out-of-hours general practitioners cooperative (GPC) and the pharmacist area covered by the GPC (Antwerp city) | N/A |
| Colliers et al., 2020 (Belgium) | Antibiotics (Basel) (2023: 4,3) | To explore why and how GPs make antibiotic prescribing decisions | Video-recordings of 160 antibiotic prescribing decision consultations and semi-structured interviews; 21 GPs; General practices at out-of-hours primary care | August - November 2018 |
| Courtenay et al., 2017 (United Kingdom) | BMJ Open (2023: 2,4) | To explore patients' expectations and experiences of non-medical prescriber-led management of respiratory tract infections (RTIs), to examine whether patient expectations for antibiotics affect the likelihood of receiving them and to understand factors influencing patient satisfaction with RTI consultations | Mixed methods - Questionnaires (120 patients) and follow-up interviews; 22 patients, 16 nurses and 1 pharmacist (referred to as non-medical prescribers); general practices and related communities | August 2014 - November 2015 |
| Courtenay et al., 2019 (United Kingdom) | BMJ Open (2023: 2,4) | To identify the factors that influence nurse and pharmacist prescriber management of respiratory tract infections and to identify the behaviour change techniques to support appropriate prescribing behaviour | Semi-structured interviews; 4 pharmacists and 17 nurses; primary care settings | June - July 2017 |
| Cox et al., 2023 (The Netherlands) | Antibiotics (2023: 4.3) | To investigate experiences, expectations, motivations, and perspectives of patients with UTIs in general practice | Semi-structured online interviews; 14 female UTI patients in general practice; primary care, Netherlands | N/A |
| Dallas et al., 2020 (Australia) | Family Practice (2022: 2,4) | To explore experiences, perceptions and attitudes of GP vocational trainees and supervisors to delayed antibiotic prescribing for acute self-limiting respiratory tract infections (ARTIs). | Semi-structured telephone interviews; 12 GP trainees and 10 supervisors; General practices (the states of New South Wales, Tasmania and the Australian Capital Territory). | April- September 2018. |
| Darj et al., 2019 (Bangladesh) | Global Health Action (2023: 2.2) | To explore retail pharmacists' perceptions of AMR and to encourage them to explain their knowledge and role in the AMR situation in Bangladesh | In-depth, semi-structured interviews; 24 pharmacists; retail pharmacies - Dhaka, Bangladesh. | The course of two months in 2018. |
| Dempsey et al., 2014 (United States of America) | BMC Family Practice (2023: 3,2) | To identify and understand primary care clinician perceptions about antibiotic prescribing for acute bronchitis | Semi-structured interviews; 12 primary care physicians (speciality unknown) and 1 nurse practitioner; primary care; Boston | N/A |
| Duane et al., 2016 (Ireland) | BMJ Open (2023: 2,4) | To explore the culture of antibiotic prescribing and consumption in the community for urinary tract infections (UTI) from the perspective of the general practitioners (GPs) and community member | In-depth interviews, and 6 focus groups interviews; 15 GPs (in-depth interviews) and 42 focus group participants/patients; rural and urban locations | 2013 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|----------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Durand et al., 2022 (France) | Journal of the American Pharmacists Association (2023: 2,3) | To explore the perceptions, current practices and interventions of community pharmacists regarding antimicrobial stewardship | Semi-structured interviews; 16 pharmacists; community-based pharmacies in rural areas and cities | February -May 2021 |
| Essilini et al., 2021 (France) | JAC Antimicrobial Resistance (2023: 3,7) | To explore French community pharmacists' views on antibiotic stewardship (ABS) and antibiotic resistance, their role and current practices, and future opportunities for ABS | Semi-structured interviews; 27 pharmacists; community pharmacies in north-eastern France | May - October 2019 |
| Fletcher-Lartey et al., 2016 (Australia) | BMJ Open (2023: 2,4) | To describe what role patients expectation play in GPs antibiotic prescribing for upper respiratory tract infections | Mixed methods approach using a cross-sectional survey and semi-structured interviews; 32 GPs (interview); Primary care GPs | May - August 2014 |
| Gaarslev et al., 2016 (Australia) | Antimicrobial Resistance and Infection Control (2023: 4.8) | To explore the social and cultural norms surrounding expectations for antibiotics and understand possible communication strategies to decrease patient demand | Mixed methods: cross sectional survey and 4(5) focus group interviews; 21(+) adult citizens; Sydney CBD and Western Sydney | August 2014 |
| Gautham et al., 2024 (India) | BMJ Open (2023: 2,4) | To explore the individual, community and health system-level factors influencing community antibiotic practices in rural West Bengal in India | 8 Focus group interviews and in-depth interviews; 98 adult community members (focus groups), 7 teachers, 4 elected village representatives, 2 doctors, 3 social workers and 14 community health workers (interviews); South 24 Parganas district, West Bengal | November 2019 - January 2020 |
| Ghiga and Stålsby Lundborg, 2016 (Romania) | Journal of Pharmaceutical Policy and Practice (2023: 4,2) | To explore the perceptions of Romanian pharmacists, when it comes to the role they play in antibiotic consumption and antibiotic resistance | Semi-structured interviews; 18 pharmacists; 16 different districts and Bucharest | February - March 2015 |
| Ghiga et al., 2023 (Romania) | BMC Primary Care (2023: 3,2) | To increase the understanding of howGPs perceive the phenomenon of antibiotic consumption and antibiotic resistance in Romania, including how they see their roles in this respect | Semi-structured interviews; 12 GPs; rural and urban areas; Romania | September - October 2021 |
| Grigoryan et al., 2022 (United States and Germany) | BMC Womens Health (2023: 4,2) | To understand the emotional experience of women with uncomplicated urinary tract infection | Semi-structured interviews; 65 women (40 from US, 25 from Germany); across the two countries | November - December, 2019 |
| Guo et al., 2021 (Singapore) | BMC Family Practice (2023: 3,2) | To explore processes underpinning decision-making for antibiotic prescribing, by considering doctors' experiences | Semi-structured interviews; 30 primary care physicians (17 with unknown specialisation and 13 GPs); public and private primary care settings | June 2018 - January 2020 |
| Halls et al., 2017 (United Kingdom) | BMJ Open (2023: 2,4) | To explore parents' perspectives, concerns and experiences of the management of lower respiratory tract infections in children in primary care | Semi-structured interviews; 23 parents; primary care | January 2013 - March 2015 |
| Hika et al., 2022 (New Zealand) | Antibiotics (Basel) (2023: 4,3) | To explore experiences, perceptions and beliefs that Maori have about antibiotics and the use of antibiotics in regard to acute upper respiratory tract symptoms, and of antimicrobial resistance | Semi-structured interviews; 30 Maori; primary care | N/A |
| Hoang et al., 2024 (Vietnam) | Critical Public Health (2022: 2,8) | To explore how community pharmacists' everyday practices are entangled with consumers access to primary healthcare system | Semi-structured interviews; 24 pharmacists; Community pharmacies | April- September 2019 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Horwood et al., 2016 (United Kingdom) | British Journal of General Practice (2023: 5,3) | To investigate healthcare professional diagnostic and antibiotic prescribing decisions for children with respiratory tract infections | Semi-structured interviews; 22 GPs and 6 nurses; General practices | N/A |
| Hu et al., 2024 (United Kingdom) | BJGP Open (2022: 2,8) | To explore community pharmacists' perceptions and experiences of advising patients on management of acute respiratory tract infections and urinary tract infections, and to explore issues regarding use of over-the-counter medicines | Semi-structured interview; 18 pharmacists; Community pharmacies in London and Oxford | November 2019 - March 2020 |
| Jakupi et al., 2019 (Kosovo) | Pharmacy Practice (2023: 2,4) | To explore to explore the attitudes, experiences and knowledge of users, pharmacists and prescribers towards antibiotics in Kosovo | Semi-structured interviews; 8 patients, 4 pharmacists, 4 primary care physicians (3 GPs and 1 with unknown specialisation); primary care | 2015-2016 |
| Jones et al., 2018 (United Kingdom) | BMJ Open (2023: 2,4) | To explore pharmacists' and pharmacy staff attitudes and experiences around selfcare advice for common infections, antibiotic compliance advice, AMS activities and AMR. | Semi-structured interviews and focus group interviews; 8 GPs, 28 pharmacists, 13 pharmacy staff, 6 representatives from pharmacy organisations in England and Wales, and 2 local stakeholders; Pharmacies, general practices and national organisations | N/A |
| Kaminsky et al., 2020 (Sweden) | BMC Nursing (2023: 3,1) | To describe nurses' views of telephone nursing work with callers contacting primary healthcare centres regarding respiratory tract infections | Semi-structured interviews; 12 nurses; primary healthcare | January - February 2014 |
| Khan et al., 2021 (Pakistan) | International Journal of Environmental Research and Public Health (2022: 4,6) | To evaluate the knowledge, attitude, and perception of community pharmacists in Pakistan regarding the nonprescription dispensing of antibiotics and how to improve the rational use of antibiotics | A two-phase mixed-methods study 1. Online questionnaire, a cross-sectional study; 180 community pharmacists; community pharmacy services 2. Telephone/online semi-structured interviews; 21 pharmacists; community pharmacy services | August 2019 - March 2020 |
| Khan et al., 2022 (Pakistan) | Frontiers in Pharmacology (2024: 4,4) | To investigate the knowledge, attitude, and practices on antibiotic consumption, antibiotic resistance, and related suggestions among residents of conflicted zones in Pakistan | Semi-structured interviews; 20 patients ; community pharmacies in Pashto | September 2019-January 2020 |
| Knobloch et al., 2021 (United States of America) | American Journal of Infection Control (2023: 3,8) | To identify barriers and facilitators to guideline-concordant prescribing among nurse practitioners prescribing to veterans in an outpatient setting, and to explore perspectives about perceived roles in antibiotic stewardship efforts | Mixed methods design, consisting of quantitative data on nurse practitioners prescribing for diagnosis in which antibiotics are not indicated and individual qualitative semi-structured, interviews and focus group interviews; 14 nurse practitioners, 15 veterans (3 focus groups interviews); outpatient veterans care | November 2019 - January 2020 |
| Kurotschka et al., 2024 (Germany) | BJGP OPEN (2023: 5,3) | To explore the decision making of GPs when managing uncomplicated urinary tract infections in women | Semi-structured, face-to-face interviews; 22 GPs in Bavaria and Baden-Württemberg (southern Germany) | September - December 2019 |
| Laytner et al., 2023 (United States of America) | The Journal of the American Board of Family Medicine (2022: 2,0) | To identify the situations, reasons, and motivations influencing Hispanic patients' nonprescription use | Semi-structured digitally interviews (second phase of a mixed method study); 35 Hispanic patients; Public clinics in Houston and one private emergency department | May 2020 - October 2021 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Lescure et al., 2022 (The Netherlands) | BMC Primary Care (2023: 3,2) | To establish GPs' and pharmacists' perceptions, attitudes and experiences regarding the provision of antibiotics to immigrant patients | In-depth, semi-structured interviews; 10 GPs and 5 pharmacists in Rotterdam | November 2018 - August 2020 |
| Lipstein et al., 2019 (United States of America) | Clinical Pediatrics (2023: 1,0) | To understand how parents and physicians make decisions regarding antibiotics and whether a potential associated risk of obesity would alter decisions | 8 focus group interviews and individual, semi-structured interviews; 59 parents/ caregivers of children under age 7 years (focus group) and 22 physicians (19 paediatricians; 2 family physicians, 1 medicine-paediatrician (individual interviews) | N/A |
| Lum et al., 2017 (Australia) | BMC Public Health (2023: 3,5) | To investigate the perspectives, attitudes and behaviours of Australian patients on antibiotic use and antibiotic resistance, to inform national programs for reducing inappropriate antibiotic consumption | Semi-structured interviews; 32 patients; South East Queensland | May - June 2015 |
| Lum et al., 2018 (Australia) | Infection, Disease & Health (2023: 2,7) | To establish the dominant factors influencing GPs decision-making in antibiotic prescribing in the Australian primary healthcare sector | Mixed method design consisting of semi-structured interviews and a Discrete Choice Experiment; 33 GPs; Brisbane and Greater Brisbane, Queensland | September 2015 - October 2016 |
| Mahmoud et al., 2018 (Saudi Arabia) | Biomedical Research (2022: 3,07) | To explore community pharmacists' views, experiences, and perceptions about antibiotics dispensing without prescription | Semi-structured interviews; 16 pharmacists; community pharmacies in Riyadh, Saudi Arabia | N/A |
| Manderson, L., 2020 (South Africa) | Humanities & Social Sciences Communications (2023: 3,7) | To explore factors in the provision of health care, health systems and structural factors, and communication between providers and patients that influence the use of antibiotics | Observation study, semi-structured interviews in GP practice and open-ended interviews with stakeholders; 65 patients/parents/guardians, 8 primary care physicians (speciality unknown) , 15 nurse practitioners/senior community nurses, 2 pharmacists; 12 stakeholders; private physicians' surgeries and community health centres | June - September 2017 |
| Mas-Dalmau et al., 2023 (Spain) | BMC Primary Care (2023: 3,2) | To explore perceptions and attitudes in primary care providers, regarding antibiotic use and different strategies for uncomplicated respiratory tract infections | 4 focus group discussions and individual semi-structured interviews; 25 GPs, 1 nurse; primary care centres in Barcelona metropolitan area, Spain | September 2013 - December 2018 |
| McDermott, L., Leydon, G. M., Halls, A., Kelly, J., Nagle, A., White, J. & Little, P., 2017 (United Kingdom) | BMJ Open (2022: 2,9) | To explore perceptions of illness, the decisions to consult and the acceptability of delayed antibiotic prescriptions and self-help treatments for respiratory tract infections | Semi-structured interviews (face-to-face and telephone); 20 patients; Primary care in South of England | N/A |
| Medina-Perucha et al., 2020 (Spain) | PLoS ONE (2021: 3,7) | To explore the experiences and concerns of service users with acute lower respiratory tract infections, in relation to access to healthcare, antibiotic use and health education in Catalonia | Semi-structured interviews; 29 patients; three primary healthcare centres in Barcelona and one in Tarragona, Catalonia, Spain | April-June 2019 |
| Mortazhejri et al., 2020 (Canada) | BMC Family Practice (2022: 2,9) | To explore how individuals perceive upper respiratory tract infections and how their perceptions influence their self-management, primary care consultation and antibiotic use | Semi-structured telephone interviews; 15 patients; urban/rural family practice in Eastern Ontario, Canada | N/A |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|-------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Musoke et al., 2023 (Uganda) | Journal of Pharmaceutical Policy and Practice (2023: 4,2) | To explore knowledge and practices related to AMS in private pharmacies in Wakiso district, central Uganda | 31 in-depth interviews; 3 clinical officers, 3 midwives, 6 nurses, 5 nursing assistants, 1 pharmacist, 2 enrolled nurses, 9 pharmacy technicians, 1 psychiatric nurse, 1 social scientist; Private pharmacies in Wakiso district, central Uganda | 2022 |
| Mustafa et al., 2014 (United Kingdoms) | Annals of Family Medicine (2021: 5,7) | To explore how and why GPs (family physicians) elicit and address patients' or parents' expectations for antibiotics | In-depth, face-to-face semi-structured interviews; 20 GPs; South Wales, United Kingdom | October 2010 - April 2011 |
| O'Doherty et al., 2019 (Ireland) | BMC Family Practice (2022: 2,9) | To investigate why GPs continue to prescribe antibiotics for ARTIs despite increasing knowledge of their poor efficacy and worsening antimicrobial resistance | Semi-structured interviews; 13 GPs; General practices (urban and rural settings), Mid-West of Ireland | June - August 2017 |
| Om et al., 2017 (Cambodia) | Antimicrobial Resistance & Infection Control (2023: 4,8) | To explore healthcare seeking behaviour related to obtaining antibiotics and drivers of antibiotic misuse in the Cambodian community | 6 focus group discussions and in-depth, individual interviews; 30 nurses (FGD), 35 family members of hospitalised patients, 10 pharmacists (individual interviews); Public hospitals, private pharmacies and community primary healthcare centres in Cambodia | September 2013 - February 2014 |
| Özcebe et al., 2022 (Turkey, Germany, Sweden and the Netherlands) | BMC Primary Care (2023: 3,2) | To explore GPs and pharmacists' experiences and perspectives on rational antibiotic use among Turkish adults in Turkey and among Turkish migrants in Germany, Sweden, and the Netherlands | In-depth, semi-structured face-to-face/telephone interviews; 21 GPs (family physicians) and 24 pharmacists; community care | 2016 - 2017 |
| Peiffer-Smadja et al., 2020 (United Kingdom) | Antibiotics (2023: 4,3) | To explore the views of pharmacy staff and patients on providing or receiving advice for suspected or confirmed urinary tract infections in the community pharmacy setting, and to identify opportunities to enhance the role of community pharmacists in the management of patients | A mixed method study; two surveys and semi-structured interviews; 22 pharmacists; Community pharmacy settings in Newham, London | April 2019-? |
| Poss-Doering et al., 2020 (Germany) | Antimicrobial Resistance and Infection Control (2023: 4,8) | To foster awareness and understanding of the growing challenge and promote rational antibiotics use for acute, non-complicated and self-limiting infections | Mixed method: A one-time socio-demographic survey and semi-structured telephone interviews; 27 physicians (speciality unknown); Primary care networks in Bavaria and North-Rhine Westphalia | March - June 2018 |
| Raspopovic et al., 2016 (Montenegro) | Medicinski Casopis (Impact Factor unknown) | To reveal factors that influence unduly prescribing antibiotics and the emergence of resistance to antibiotics in primary health care | One focus group interviews; 6 primary care physicians (speciality unknown), 1 paediatrician, 1 pharmacist; Health centre in Danilovgrad, Montenegro | November 2015 - June 2016 |
| Res et al., 2017 (Australia) | Journal of Pharmacy Practice (2023: 2,4) | To explore the role of community pharmacists in the optimisation of antibiotic prescribing and utilisation. | Four focus group interviews; 24 pharmacists; Community pharmacy in the Perth metropolitan area | March - April 2013 |
| Ryves et al., 2016 (United Kingdom) | BMJ Open (2022: 2,9) | To identify GPs views on the use of delayed prescribing, their use of the technique and factors that can enhance or inhibit its use in routine general practice, and to elicit GPs' views on current prescribing guidelines, and what information would be beneficial if training were to be provided | Semi-structured telephone interviews; 32 GPs; GP practices in England | November 2013 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|---------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Saleem et al., 2019 (Pakistan) | Family medicine and Community Health (2022: 6,1) | To explore the determinants of AMR and the pattern of antimicrobial dispensing among community pharmacists | In-depth, face-to-face, semi-structured interviews; 12 pharmacists; Community pharmacists in Lahore, Pakistan | October 2017 - January 2018 |
| Saliba-Gustafsson et al., 2019 (Malta) | PLoS ONE (2021: 3,7) | To explore GPs' understanding of antibiotic use and resistance, and describe their perceived barriers and facilitators to prudent antibiotic prescribing for acute respiratory tract infections in Malta | Face-to-face individual semi-structured interviews; 20 GPs; Public and/or private GP practices in Malta | August - September 2014 |
| Saliba-Gustafsson et al., 2021 (Malta) | PLoS ONE (2021: 3,7) | To explore and describe the perceptions of delayed antibiotic prescription for respiratory tract infections among GPs in Malta | Individual, semi-structured face-to-face interviews; 20 GPs; Public and/or private GP practices in Malta | August - September 2014 |
| Salim and Elgizoli, 2017 (Sudan) | International Journal of Pharmacy Practice (2023: 1,5) | To explore the perspectives of community pharmacists about why they dispense antibiotics without prescription, and to understand their opinions about why they think patients self-medicate | Individual, in-depth face-to-face interviews; 30 pharmacists; Community pharmacies in Khartoum States, Sudan | May - June 2015 |
| Sargent et al., 2017 (Australia) | BMC Family Practice (2022: 2,9) | To identify facilitators and barriers to GPs' use of delayed prescribing and to gain pharmacists' and the public's views about delayed prescribing in Australia | Semi-structured, face-to-face interviews; 18 GPs, 9 pharmacists, 3 pharmacy assistants and 14 patients; the Gold Coast and the Sunshine Coast, Queensland, Australia | February 2014 - July 2015 |
| Sayood et al., 2021 (United States of America) | Journal of the American Pharmacists Association (2023: 2,5) | To determine community pharmacist attitudes towards using a computerised CDS tool to evaluate and manage common complaints to then promote appropriate antibiotic prescribing | In-depth semi-structured telephone interviews; 21 pharmacists; Community pharmacies in Missouri, Illinois, California, Arizona, Utah, Tennessee, and Texas | October 2019 - May 2020 |
| Sharaf et al., 2021 (Qatar) | Antibiotics (2023: 4,3) | To explore barriers of appropriate antibiotic prescription from the physicians' and pharmacists' perspectives at primary healthcare centres in Qatar | Five focus groups; 30 primary care physicians (family medicine physicians, GPs, specialists or consultants), 20 pharmacists; Two primary health care centres in Qatar | N/A |
| Simeoni et al., 2022 (Canada) | BMC Primary Care (2023: 3,2) | To identify potentially modifiable determinants of antibiotic prescribing for patients presenting to primary care with upper respiratory tract infection symptoms | Semi-structured telephone interviews; 20 GPs (family physicians); Primary care and walk-in clinics in Ontario | March - December 2019 |
| Souto-López et al., 2020 (Spain) | Acta Paediatrica (2023: 2,4) | To explore the parent-related factors underlying antibiotic misuse/overuse and their implication in the development of resistance in the paediatric population | Five focus group interviews; 30 parents of children under 12 years of age; Galicia, north-west Spain | 2017 |
| Spicer et al., 2020, (United States of America) | Open Forum Infectious Diseases (2021: 4,42) | To understand whether adult patients viewed antibiotic risk differently and determine whether other antibiotic risks, such as adverse drug events, would be more effective for public health messaging | 12 focus groups via telephone; 31 participants (15 parents and 16 adult patients) New York, Rhode Island, Kentucky, Louisiana, Mississippi, Tennessee, West Virginia, Iowa, Nebraska, Utah | March 2017 |
| Stivers, T. & Timmermans, S., 2021 (United States of America) | Social Science & Medicine (2023: 4,9) | To advance the understanding of physician-patient negotiation in the context of acute respiratory infections | Observation study: Two corpora of 68 video recordings of primary care consultations; 30 primary care physicians (speciality unknown); community-based clinics in Southern California | Data collection 1: 2003 - 2004 Data collection 2: 2015 - 2016 |
| Sundvall et al., 2020 (Sweden) | BJGP Open (2023: 5,3) | To explore how opportunities and obstacles for rational antibiotic prescribing were perceived by primary health care centres | Document analysis including 50 reports from primary health care centres in Region Västra Götaland, Sweden | 2013-2016 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design; Study Population; Setting | Study Period |
|---------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Suy et al., 2019 (Cambodia) | BMJ Global Health (2024: 7,1) | To investigate factors influencing community decisions on purchasing medicines from primary care providers and reasons for using invisible medicine sellers and compare different primary care providers' knowledge of antibiotic use | Seven focus group discussions and individual, semi-structured interviews; 60 community members (FGD), 5 pharmacists, 3 primary care physicians (speciality unknown), 5 medicine sellers, 1 midwife, 1 nurse, 1 unqualified seller, 5 invisible medicine sellers, 4 government health centres staff, 4 community health workers, 6 village leaders (individual interviews); peri-urban districts in Phnom Penh, Cambodia | N/A |
| Sychareun et al., 2022 (Lao PDR) | BMC Pregnancy and Childbirth (2023: 2,8) | To explore perceptions and reported practices of pregnant women and mothers of children under two regarding antibiotic use and resistance | Six focus groups discussions; 55 participants (pregnant women and mothers with children under two years of age) Toulakhom district in Vientiane Province, Lao PDR | September 2019 |
| Thaggard et al., 2023 (New Zealand) | BMC Infectious Diseases (2023: 3,4) | To explore whānau Māori and Pacific people's knowledge, perceptions, and expectations regarding antibiotic treatment of URTIs with the aim of informing development of educational resources that could build knowledge and skills and reduce the inappropriate prescribing of antibiotics | Six focus group interviews; 47 adult citizens; Auckland (NZ's largest city) and Taranaki (regional city) | N/A |
| Tonna et al., 2020 (United Kingdom) | International Journal of Clinical Pharmacy (2023: 2,6) | To explore views and experiences of community pharmacy teams across Scotland on antimicrobial stewardship, activities related to European Antibiotic Awareness Day, and a self-help guide to treating infection | Semi-structured in-depth telephone interviews; 20 pharmacists, 5 pharmacy graduates undertaking a one year internship, 2 pharmacy technicians, 1 medicines counter assistant; Community pharmacies in Scotland | November - December 2016 |
| Torres et al., 2020 (Mozambique) | Pharmacy Practice (2023: 2,4) | To describe the practices and the enablers for non-prescribed antibiotic dispensing in Maputo city, Mozambique | In-depth, face-to-face, semi-structured interviews; 17 pharmacists; Private pharmacies, Maputo city | October 2018 - March 2019 |
| Torres et al., 2023 (Mozambique) | Journal of Public Health: From Theory to Practice (2023: 1,9) | To describe the underlying factors influencing self-medication with antibiotics in Maputo city, Mozambique | Individual, in-depth interviews and two focus group discussions; 32 patients; Pharmacies, Maputo city | October 2018 - March 2019 |
| van der Zande et al., 2019 (United Kingdom) | BMC Family Practice (2022: 2,9) | To understand contextual factors related to GPs' antibiotic prescribing behaviour in low, high, and around the mean prescribing primary care practices | Semi-structured interviews; 41 GPs; GP practices in a large urban North-West English city | January - June 2018 |
| van Hecke et al., 2019a (United Kingdom) | Journal of Antimicrobial Chemotherapy (2023: 3,9) | To explore parents' perceptions and understanding of antibiotic use and resistance in the context of their young child with an acute respiratory tract infection and to explore strategies parents would find acceptable to minimise antibiotic resistance for their families | Semi-structured interviews; 23 parents of preschool children; Thames Valley region: Berkshire, Buckinghamshire and Oxfordshire, South-East England | 2016–2017 |
| van Hecke et al., 2019b (South Africa) | BMJ Open (2022: 2,9) | To explore the perceptions of primary care providers about prescribing antibiotics for two common infection syndromes, their experiences of existing point-of-care testing, and their perceptions of the barriers and opportunities for introducing new point-of-care testing | Semi-structured interviews; 8 nurses, 4 physicians without specialisation, 11 GPs (family physicians); Publicly funded clinics in the Western Cape Metro district, South Africa | March - April 2018 |
| van Horrik et al., 2024 (The Netherlands) | BJGP Open (2023: 5,3) | To identify barriers and facilitators for applying shared decision making in cystitis management in general practice | Semi-structured interviews; 10 GPs, 7 GP assistants, and 15 patients; general practice | May - October 2022 |

(Continued)

TABLE 4 Continued

| Author(s), Year of Publication (Country) | Journal (Year: Impact Factor) | Study Aim | Design: Study Population; Setting | Study Period |
|-----------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Williams et al., 2018 (United Kingdom) | Journal of Antimicrobial Chemotherapy (2023: 3.9) | To explore GPs and nurse prescribers' views on and experiences of prescribing antibiotics for RTIs in primary care out-of-hours services | Semi-structured telephone interviews; 15 GPs and 15 nurses (with prescription certificate); rural and urban primary care out-of-hours services | November 2015 - April 2016 |
| Yates et al., 2018 (United States of America) | BMC Family Practice (2022: 2.9) | To explore elements influencing primary care provider decisions to prescribe antibiotics, identify provider recommendations for interventions to reduce inappropriate antibiotic use, and inform the clinical management of patients in the outpatient environment for infections that do not require antibiotics | Semi-structured interviews; 10 primary care physicians (specialty unknown), 7 advanced care practitioners (nurse practitioners and physicians assistants); primary care | November - December 2016 |
| Zago et al., 2023 (Brazil) | Health Expectations (2023: 3) | To map aspects that shape users' lay knowledge regarding antibiotics use and AMR | Individual in-depth interviews; 19 adult citizens; Brazil | August - October 2021 |
| Zetts et al., 2020 (United States of America) | BMJ Open (2022: 2.9) | To assess primary care physicians current attitudes towards antibiotic resistance, inappropriate antibiotic prescribing and the feasibility of outpatient stewardship efforts | 8 focus group interviews; 26 primary care physicians (family medicine, internal medicine physicians), 26 paediatricians; community care | November - December 2017 |

Timmermans (2021) also included a study period from 2003 to 2004. Seventeen of the other publications did not specify their study periods. The publications' total population included 962 primary care physicians, such as GPs, psychiatrists, surgeons, pediatricians and unspecified physicians, 591 pharmacists, 147 nurses, 1100 (+) patients and 236 others, including stakeholders and other health care professionals.

All selected publications demonstrated appropriate methodological rigor based on the outcomes of the CASP checklist (Critical Appraisal Skills Program, 2018) (Table 3).

Relationships between patients and professionals influenced educational strategies

The significance of a robust patient-professional relationship

From the perspectives of primary care physicians, pharmacists, nurses, and patients, a trusting relationship was perceived to create an environment where patients could feel acknowledged and heard (Alzard et al., 2024; Bergsholm et al., 2023a; Brookes-Howell et al., 2014; Dallas et al., 2020; Durand et al., 2022; Ghiga and Stålsby Lundborg, 2016; Hika et al., 2022; Khan et al., 2022; Mustafa et al., 2014; Sargent et al., 2017; Sköld et al., 2017; Souto-López et al., 2020; Spicer et al., 2020; Suy et al., 2019; Thaggard et al., 2023; Zetts et al., 2020). Trust and robustness was crucial when facilitating effective education and guidance regarding antibiotic use, and it reduced patient expectations for antibiotics (Alhomoud et al., 2018; Aponte-González et al., 2019; Bergsholm et al., 2023b; Ghiga and Stålsby Lundborg, 2016; Saleem et al., 2019; Sargent et al., 2017; Simeoni et al., 2022; Zetts et al., 2020). This allowed the professionals to manage patient expectations more effectively, including explaining the reasons for not prescribing antibiotics (Simeoni et al., 2022; Zetts et al., 2020). For instance, both primary care physicians and nurses highlighted the importance of discussing treatment options with the patients', facilitating a collaborative environment where patients felt their input was valued (Boiko et al., 2020; Guo et al., 2021; Halls et al., 2017). Discussing antibiotic use with patients gave some primary care physicians a sense of control over the situation (Dallas et al., 2020; Guo et al., 2021; Kurotschka et al., 2024). This included discussing different treatments' potential benefits and AMR risks (Ashdown et al., 2016; Kurotschka et al., 2024). Several primary care physicians perceived these approaches as critical components of the educational role (Ashdown et al., 2016; Guo et al., 2021; Kurotschka et al., 2024).

According to primary care physicians', pharmacists' and patients' view, a solid relationship promoted adherence to prescribed treatments and overall receptiveness to medical advice (Alzard et al., 2024; Guo et al., 2021; Hika et al., 2022; Kurotschka et al., 2024; Lum et al., 2017; Mustafa et al., 2014). Pharmacists also engaged patients in decision-making by asking pertinent questions about physicians' advice, such as dosing intervals or indications of a specific antibiotic (Bergsholm et al., 2023a). Furthermore, taking into account patients' previous experiences with medications was reported to foster trust, which emerged as a critical factor in

building confidence in prescribing/dispensing decisions (Bergsholm et al., 2023b; Brookes-Howell et al., 2014; Courtenay et al., 2019; Dallas et al., 2020; Guo et al., 2021; Knobloch et al., 2021; van der Zande et al., 2019; Zetts et al., 2020). Some pharmacists highlighted that informal interactions fostered rapport, increased awareness of antibiotic use and resistance (Durand et al., 2022), and enhanced their accessibility and role in community healthcare through valuable information and free counselling during medication dispensing (Alhomoud et al., 2018). Primary care physicians and pharmacists also noted that a solid relationship could help manage patient dissatisfaction, even when treatments did not meet patients' expectations (Kurotschka et al., 2024; Ghiga et al., 2023; Simeoni et al., 2022). Explaining why antibiotics were not prescribed while acknowledging patients' experiences helped build stronger relationships.

Various strategies for facilitating effective communication

Several primary care physicians and nurses emphasized the significance of practical communication skills in explaining treatment decisions, particularly the decision not to prescribe antibiotics (Bergsholm et al., 2023a; Courtenay et al., 2017; Sköld et al., 2017). Effective communication involved using precise language, providing clear information, and addressing potential misunderstandings, regardless of the healthcare professional's background (Alkirawan et al., 2022; Bergsholm et al., 2023b; Fletcher-Lartey et al., 2016; Lum et al., 2017). Various strategies were reported, such as creating a more inclusive and supportive environment, bridging gaps in patient understanding, and using informal language (Bergsholm et al., 2023b; Guo et al., 2021). Addressing language barriers and providing both verbal and written information were also perceived as effective strategies for improving communication (Fletcher-Lartey et al., 2016; Laytner et al., 2023).

Primary care physicians frequently used clinical tools, such as C-reactive protein tests, to explain why antibiotics were unnecessary (Lescure et al., 2022; Özcebe et al., 2022). Pharmacists supported reduction of antibiotic misuse by providing clear instructions on dosages, explaining the risks of misuse, and offering non-antibiotic alternatives (Jones et al., 2018; Manderson, 2020; Om et al., 2017; Özcebe et al., 2022; Saleem et al., 2019; Sayood et al., 2021). Some pharmacists also asked follow-up questions to assess symptom severity and to guide or advise patients to see a physician (Mahmoud et al., 2018; Sayood et al., 2021). Some experienced primary care physicians also developed strategies such as 'preparing the ground', which involved taking a comprehensive history, conducting thorough examinations, and communicating decisions empathetically (Lum et al., 2018). Medical histories and clinical examinations also played a crucial role in explaining why antibiotics were not prescribed, demonstrating that decisions were made with patients' best interests in mind while fostering trust and managing expectations (Lum et al., 2018; Manderson, 2020).

Primary care physicians, pharmacists and nurses emphasized the risks associated with overusing antibiotics, storing leftover medications, self-medicating, and stopping treatment

prematurely. They also reassured patients about viral illnesses and normalized infections and encouraged self-management to reduce unnecessary antibiotic use (Anderson et al., 2019; Biezen et al., 2017; Boaitey et al., 2023; Boiko et al., 2020; Saliba-Gustafsson et al., 2021; Yates et al., 2018). Many primary care physicians and nurses viewed running commentary and acknowledging patients' illnesses during consultations as crucial to reduce unnecessary antibiotic use (Mustafa et al., 2014; Williams et al., 2018). This was perceived as an important help to adjust patients' preconceived notions about the necessity of antibiotics (Mustafa et al., 2014). Both primary care physicians and pharmacists emphasized the absence of bacterial symptoms (Bergsholm et al., 2023b; Colliers et al., 2020; Knobloch et al., 2021; Cabral et al., 2016; Mustafa et al., 2014; Sköld et al., 2017; Özcebe et al., 2022), which several patients recognized as a valuable effort to educate them and reinforce trust in the decision-making process (Brookes-Howell et al., 2014; Cabral et al., 2014).

Some primary care physicians used therapeutic guidelines on antibiotic use. However, more of them had had negative experiences using guidelines during the consultation, fearing that patients might judge them and believe they were unsure how to treat the condition (Boaitey et al., 2023). In contrast, patients reported a lack of sufficient 'safety-netting advice,' indicating that healthcare professionals did not provide enough information (Alhomoud et al., 2018; Alkadhimi et al., 2020; Alzard et al., 2024; Boiko et al., 2020; Colliers et al., 2020; Horwood et al., 2016; Kurotschka et al., 2024). Specifically, patients often felt the information was inadequate regarding the details of their infection, the rationale for not prescribing antibiotics, and the manner in which the information was conveyed (Bergsholm et al., 2023b; Cabral et al., 2014; Souto-López et al., 2020).

Different priorities and wishes for treatment

From primary care physicians' perspectives, while empowered patients were more motivated to engage with and follow the information provided at the pharmacy (Alzard et al., 2024; Bergsholm et al., 2023a), some of them perceived that this level of involvement occasionally undermined trust in their professionalism (Mustafa et al., 2014). However, in episodic care settings, where primary care physicians often lacked an established rapport with patients, time constraints and limited access to patient history further challenged their ability to confidently avoid unnecessary antibiotic prescriptions (Ryves et al., 2016; Simeoni et al., 2022). The unfamiliarity with the patients hindered effective patient education about the risks of antibiotics, often leading to a greater likelihood of issuing an antibiotic prescription (Colliers et al., 2020; Duane et al., 2016; Ryves et al., 2016; Simeoni et al., 2022). Moreover, the interpretation of patient histories, symptoms, and test results varied among primary care physicians, reflecting individualized strategies. Some primary care physicians also found it difficult to explain their antibiotic treatment choices, as these decisions were often based on instinct (Bisgaard et al., 2021).

Several primary care physicians, pharmacists and nurses reported that patients often expected antibiotics as a quick fix (Biezen et al., 2019; Bisgaard et al., 2021; Fletcher-Lartey et al., 2016; Horwood et al., 2016; Manderson, 2020; Res et al., 2017;

Sharaf et al., 2021; van der Zande et al., 2019). Managing these multifaceted pressures required a range of strategies, with both primary care physicians and pharmacists relying on patient education to address misconceptions about antibiotic use. However, several primary care physicians, pharmacists and nurses also yielded to patient demands, especially when faced with persistent pressure or difficult consultations to avoid conflict (Biezen et al., 2017; Black et al., 2014; Courtenay et al., 2019; Fletcher-Lartey et al., 2016; Kaminsky et al., 2020; Kurotschka et al., 2024; Lum et al., 2018; Manderson, 2020; Mahmoud et al., 2018; Musoke et al., 2023; Res et al., 2017; Ryves et al., 2016; Saliba-Gustafsson et al., 2021). Primary care physicians, pharmacists and nurses often assumed that patients expected antibiotic prescriptions during consultations (Biezen et al., 2017; Boiko et al., 2020; Dallas et al., 2020; Kaminsky et al., 2020; Ryves et al., 2016; Saliba-Gustafsson et al., 2021; Sargent et al., 2017). While some professionals stated to be unaffected by this pressure (Saliba-Gustafsson et al., 2021), primary care physicians and nurses expressed feeling pressured to prescribe antibiotics for infections they did not consider requiring treatment (Arnau-Sánchez et al., 2023; Boaitay et al., 2023; Courtenay et al., 2019; Duane et al., 2016; Hu et al., 2024; Kurotschka et al., 2024; Lum et al., 2018; Mustafa et al., 2014; O'Doherty et al., 2019; van der Zande et al., 2019). Pharmacists reported similar challenges (Mahmoud et al., 2018; Jones et al., 2018), noting that patients frequently pressured pharmacists to dispense antibiotics, sometimes without a prescription. However, as Manderson (2020) highlighted, patients did not always seek antibiotics, indicating that healthcare professionals sometimes misjudged patients' needs or failed to recognize the importance of patient education.

Social position made a difference

Power asymmetries in healthcare interactions were reported as an essential factor that affected both trust and robustness of the patient-professional relationship. Factors such as patient age, cultural background, comorbidities, and symptom severity were stated by professionals to contribute to increased antibiotic prescribing in, for example, episodic care settings (Simeoni et al., 2022). Language and cultural barriers complicated the efforts to educate patients about proper antibiotic use, especially in multicultural settings where communication challenges were common (Colliers et al., 2018; Hu et al., 2024; Lescure et al., 2022; Peiffer-Smadja et al., 2020). Primary care physicians often found it challenging to explain the importance of appropriate antibiotic use, mainly when they encountered patients who had poor language skills, low literacy or cultural differences (Duane et al., 2016; Fletcher-Lartey et al., 2016; Lescure et al., 2022). Primary care physicians, pharmacists and nurses acknowledged that specific training in handling difficult situations and patient conversations could enhance communication and reduce misunderstandings (Ashdown et al., 2016; Biezen et al., 2017; Guo et al., 2021; Lum et al., 2018; Mustafa et al., 2014; Poss-Doering et al., 2020; Rasopovic et al., 2016; Res et al., 2017).

From the patients' perspectives, a lack of commitment or attentiveness from primary care physicians often undermined

trust (Cabral et al., 2014; Grigoryan et al., 2022; Zago et al., 2023). Patients expressed a sense of distrust stemming from the perceived lack of personal commitment from some primary care physicians, who appeared uncaring and inattentive during consultations, marked by minimal eye contact and engagement (Cabral et al., 2014; Zago et al., 2023). Additionally, some pharmacists felt that asking too many diagnostic questions was undesirable, as it could make patients perceive them as uncertain or unqualified (Hoang et al., 2024). In some cases, from patients' perspective, primary care physicians responded to patients' questions with dismissive remarks, such as questioning patients' desire for more information (Gautham et al., 2024). Moreover, an absence of explicit discussion around repeated antibiotic prescriptions by primary care physicians could lead to patients' distrust (Halls et al., 2017; Hika et al., 2022; Lum et al., 2017). This distrust could sometimes hinder patients' receptiveness to the information provided (Bergsholm et al., 2023a). Some patients trusted pharmacists more than primary care physicians, viewing pharmacists as impartial, affordable healthcare professionals and the most knowledgeable in medication-related matters (Alhomoud et al., 2018; Mortazhejri et al., 2020). However, other patients perceived pharmacists more as 'shopkeepers' than qualified healthcare professionals, which could undermine their role in antibiotic stewardship (Darj et al., 2019).

Organizational structures challenged professionals in guiding and educating patients

Time is money, and vice versa

Primary care physicians, pharmacists, nurses, and patients recognized the urgent need for systemic changes to enhance antibiotic stewardship (Black et al., 2014; Courtenay et al., 2019; Horwood et al., 2016; Manderson, 2020). The practical challenges faced by healthcare professionals in primary care settings significantly affected their ability to effectively educate patients about antibiotic use and AMR (Bosley et al., 2021; Courtenay et al., 2019; Guo et al., 2021; Manderson, 2020; Mas-Dalmau et al., 2023; Peiffer-Smadja et al., 2020; Sharaf et al., 2021; Williams et al., 2018; Yates et al., 2018). These challenges primarily stem from a lack of resource allocation within the healthcare system and time constraints, which hindered the implementation of practices aimed at improving the management of antibiotic prescribing and dispensing (Biezen et al., 2019; Courtenay et al., 2019; Mas-Dalmau et al., 2023; Peiffer-Smadja et al., 2020).

In time-pressured environments, many primary care physicians perceived shared decision-making as too time-consuming, particularly when a more significant number of treatment options needed to be discussed (Alkadhimi et al., 2020; Alzard et al., 2024; Bergsholm et al., 2023a; van Horrik et al., 2024). Time pressures were particularly intense during peak consultation periods or at the end of the week, restricting educational opportunities for physicians and patients (Guo et al., 2021; Kurotschka et al., 2024). Moreover, in

some countries such as South Africa, long journeys to clinics and crowded conditions impeded patients' access to follow-up care and proper education, leading to increased antibiotic use (van Hecke et al., 2019b). Often primary care physicians and nurses managed a high volume of patients each day, which forced them to rely on providing written information to save time during consultations. Nevertheless, some healthcare professionals expressed concern that offering only written information may limit the effectiveness of the educational message reaching patients (Boiko et al., 2020). Furthermore, from nurses' perspective, time constraints during consultations often led to a focus on advising patients to take prescribed antibiotics without adequately addressing essential topics such as antibiotic resistance or self-care (Manderson, 2020). Patients often perceived rushed consultations as unhelpful, leading them to struggle with understanding essential treatment details such as dosage, duration, and appropriate antibiotic use (Cox et al., 2023; Gautham et al., 2024; Zago et al., 2023).

Less experienced professionals and those working in high-pressure environments were particularly prone to over-prescribing antibiotics (Ryves et al., 2016; Sundvall et al., 2020). Some primary care physicians and nurses opted to prescribe antibiotics as a quicker solution than not doing it, especially when they were running behind schedule or facing a high volume of patients (Biezen et al., 2017, 2019; Brisley et al., 2023; Guo et al., 2021; Kurotschka et al., 2024; Lescure et al., 2022; van der Zande et al., 2019). Discussions about risks and benefits of antibiotics were often limited, and some patients reported that primary care physicians did not always provide essential information regarding the administration of antibiotics or potential adverse reactions (Lum et al., 2017; Manderson, 2020; Mas-Dalmau et al., 2023; Mortazhejri et al., 2020). This lack of education left patients dissatisfied with the consultation and uncertain about when antibiotics were appropriate, contributing to confusion and frustration (Brookes-Howell et al., 2014; Gaarslev et al., 2016; Halls et al., 2017; Laytner et al., 2023; Lipstein et al., 2019; Sychareun et al., 2022; van Hecke et al., 2019a). Pharmacists often faced pressure to provide quick solutions after doctor consultations, leaving little time to assess antibiotic treatments or educate patients on proper use (Alzard et al., 2024). This challenge was especially acute in low-resource settings, where limited healthcare access led patients to rely on pharmacists or informal sources, prioritizing rapid dispensing over patient education (Suy et al., 2019).

The structure of the healthcare system, particularly in private sector settings, introduced another layer of complexity to antibiotic stewardship. A notable conflict existed between financial incentives and the goal of appropriate antibiotic use. Pharmacists often balanced patient numbers and sales targets, which sometimes led to inappropriate dispensing and prescribing of antibiotics, hence prioritizing profitability over patient education (Alkadhimi et al., 2020; Alhomoud et al., 2018; Musoke et al., 2023; Saleem et al., 2019; Salim and Elgizoli, 2017). The commercial pressure to increase sales, therefore, undermined their ability to focus on patient education and AMR prevention (Alkadhimi et al., 2020; Amin

et al., 2017; Salim and Elgizoli, 2017; Torres et al., 2020). In some primary care practices with more resources, such as extended consultation times and triage systems, physicians could reduce unnecessary antibiotic prescriptions by educating patients about alternative treatments. However, in some private clinics, the pressure of paid consultations made it challenging for primary care physicians to refuse requests for antibiotics. They felt obligated to provide 'value' to private patients who paid a premium, further complicating efforts to educate patients about appropriate antibiotic use (O'Doherty et al., 2019).

Technical and educational tools at stake

Several primary care physicians, pharmacists, and nurses believed that handouts and posters could effectively educate patients about unnecessary antibiotics for acute bronchitis. However, some remain skeptical about their effectiveness (Dempsey et al., 2014; Tonna et al., 2020). Pharmacists pointed out that well-intentioned awareness campaigns, such as European Antibiotic Awareness Day, often fail due to information overload, which hinders prescribers and pharmacists from delivering clear and impactful educational messages (Tonna et al., 2020). Patients expressed a desire for more comprehensive information, highlighting that gaps in communication from healthcare professionals lead to changes in how antibiotics are prescribed (Brookes-Howell et al., 2014). Additionally, patients wanted primary care physicians to take a more proactive role in antibiotic stewardship (Lum et al., 2017). In contrast, some primary care physicians viewed their involvement in antibiotic stewardship as non-essential, feeling compelled to prescribe (Ghiga et al., 2023) and influenced by the limited use of guidelines (Arнау-Sánchez et al., 2023).

Several primary care physicians refrained from using decision aids to educate patients, citing concerns that these tools might prolong consultations and disrupt their schedules (Boaitey et al., 2023). They also acknowledged the limited education patients receive regarding antibiotics and antimicrobial resistance. To address this gap, they advocated for broader public education efforts, such as school programs, media campaigns, and other community initiatives, to enhance patient awareness on these critical topics (Arнау-Sánchez et al., 2023; O'Doherty et al., 2019; Özcebe et al., 2022). Digital tools were often limited by patients' lack of digital literacy (Lescure et al., 2022). Existing educational materials were reported not to meet patients' specific needs. Furthermore, insufficient educational materials tailored to specific patient groups further restricted effective communication and patient education among primary care physicians, pharmacists, and nurses (Fletcher-Lartey et al., 2016; Kaminsky et al., 2020; Manderson, 2020; Sharaf et al., 2021). The absence of adequate IT infrastructure, such as electronic links between physicians and other healthcare professionals, also contributed to defensive prescribing practices (Saliba-Gustafsson et al., 2021). To address this issue, some primary care physicians utilized resources like 'Choosing Wisely' pamphlets, which support non-antibiotic alternatives and

help reassure patients that their symptoms are being taken seriously (Simeoni et al., 2022). However, some pharmacists pointed out that outdated guidelines complicated their ability to stay informed about antimicrobial treatments, leading them to rely on various online platforms, like Google and Medscape, or to consult drug leaflets (Jakupi et al., 2019; Musoke et al., 2023).

Lack of collaboration - a professional hierarchy

Pharmacists emphasized the importance of correct antibiotic use and education in combating antimicrobial resistance (Alhomoud et al., 2018; Alzard et al., 2024; Bergsholm et al., 2023b; Peiffer-Smadja et al., 2020; Res et al., 2017; Sayood et al., 2021). However, pharmacists often encountered patients seeking clarification on issues not fully explained during consultations with primary care physicians. These issues included the reasons for delayed prescriptions and the appropriate dosage and timing of antibiotics (Bergsholm et al., 2023b; Jakupi et al., 2019; Sayood et al., 2021). Consequently, many pharmacists viewed themselves as crucial in educating patients about antibiotic use. They frequently served as the first point of contact for advice on proper usage, potential side effects, and treatment adherence.

Additionally, socioeconomic factors greatly influenced how pharmacists educated patients about antibiotics. Financial constraints often led low-income patients to request fewer antibiotics or seek them without a prescription. Some pharmacists noted that these patients frequently turn to them for advice instead of consulting a physician (Saleem et al., 2019; Salim and Elgizoli, 2017). However, pharmacists' ability to educate patients was often hindered by limited access to patients' medical histories, which prevented them from making well-informed decisions about the appropriateness of prescribed antibiotics (Atif et al., 2020; Jones et al., 2018; Khan et al., 2021; Peiffer-Smadja et al., 2020; Sayood et al., 2021). Additionally, many pharmacists encountered communication barriers with primary care physicians, which further limited their ability to support antibiotic stewardship initiatives (Atif et al., 2020; Khan et al., 2021). In contrast, nurses had limited influence on prescribing decisions, as physicians held the final authority in cases such as managing respiratory tract infections. However, nurses frequently encouraged patients to ask their primary care physician about the rationale behind antibiotic prescriptions and offered guidance on managing symptoms without the use of antibiotics (Biezen et al., 2017). From the perspective of primary care physicians, on the other hand, pharmacists' educational advice regarding antibiotics could conflict with their own guidance, potentially confusing patients (Bergsholm et al., 2023a). Several primary care physicians expressed concerns that pharmacists might exceed their role by providing information beyond what was discussed during consultations. They preferred that pharmacists focus on dispensing medications rather than engaging in clinical discussions with patients (Bergsholm et al., 2023b).

Delayed prescription as a tool to balance all demands

When time constraints, follow-up appointments, and collaborative relations were challenging, primary care physicians often felt pressured to prescribe antibiotics as a precaution

(Manderson, 2020; Ryves et al., 2016). The practice of issuing delayed prescriptions, in which healthcare professionals such as primary care physicians or nurses provide a prescription for antibiotics but advise patients to wait a specified period before filling it, has become a common yet complex approach (Biezen et al., 2017; Lum et al., 2017, 2018; McDermott et al., 2017; O'Doherty et al., 2019; Poss-Doering et al., 2020; Ryves et al., 2016; Saliba-Gustafsson et al., 2019; Sargent et al., 2017; van der Zande et al., 2019). Both primary care physicians and nurses reported that delayed prescriptions aimed to encourage patients to follow medical advice, thereby granting them greater control over their treatment plans (Boiko et al., 2020; Dallas et al., 2020; Duane et al., 2016; Fletcher-Lartey et al., 2016; Horwood et al., 2016; Lum et al., 2018; Ryves et al., 2016; Saliba-Gustafsson et al., 2019; Sargent et al., 2017).

Variations in prescribing practices among primary care physicians often resulted in patients receiving conflicting advice, making it harder to understand when antibiotics are necessary (Lum et al., 2018; McDermott et al., 2017). Some primary care physicians noted that inconsistent messaging confuses patients and limited opportunities to educate them about respiratory infections (Ryves et al., 2016). Delayed prescriptions or granting patients complete decision-making autonomy were often suggested for specific individuals, based on their ability to understand the strategy (Mas-Dalmau et al., 2023; Ryves et al., 2016; Saliba-Gustafsson et al., 2019). However, many patients expressed discomfort with deciding whether to use antibiotics, preferring to have the physician make that decision instead (Lum et al., 2017), indicating that these strategies were not always effective or productive.

Some primary care physicians acknowledged that they prescribed delayed antibiotics despite weak evidence and concerns regarding misuse or the potential for missing severe infections (Lum et al., 2018; Ryves et al., 2016; Sargent et al., 2017). Additionally, some pharmacists dispense antibiotics without a prescription when patients requested them by name, assuming these patients were knowledgeable about their appropriate use (Mahmoud et al., 2018). Moreover, several primary care physicians pointed out that delayed prescriptions could lead to inappropriate antibiotic use, with patients either storing antibiotics for future use or taking them immediately (Sargent et al., 2017). Nevertheless, diagnostic uncertainty and lack of time led many primary care physicians to prescribe antibiotics 'just in case' rather than educating patients on appropriate usage (Biezen et al., 2019; Saliba-Gustafsson et al., 2021; Sayood et al., 2021). Consequently, delayed prescriptions were viewed as a strategy to alleviate professional insecurity and avoid the risk of neglecting to prescribe antibiotics for severe infections (Dallas et al., 2020; Lum et al., 2018; O'Doherty et al., 2019; Ryves et al., 2016; Saliba-Gustafsson et al., 2021; Sargent et al., 2017).

Discussion

The discussion will focus on three main findings: the importance of relationships between healthcare professionals and patients in facilitating successful patient education about antibiotic

use and AMR, the structural challenges that often hindered healthcare professionals from providing detailed education to patients, and the use of delayed prescriptions to balance the improvement of AMR stewardship and met patients' expectations for antibiotic treatment.

The results showed that strong relationships between healthcare professionals and patients are vital for effective patient education on antibiotic use and AMR. Trust and effective communication were consistently identified as key in ensuring patients feel understood and informed. Primary care physicians, pharmacists, and nurses each play distinct roles in fostering trust, which could encourage patients to follow advice regarding antibiotics. When patients trusted healthcare professionals, they were more likely to accept not receiving unnecessary antibiotics. These findings contribute to the existing literature (Gulliford et al., 2021; Jorgoni et al., 2022) by emphasizing the importance of relationship-building as a central component of antibiotic stewardship rather than focusing solely on medical interventions. This trust-building process is essential in overcoming patient expectations for antibiotics and can significantly influence patient engagement in antibiotic stewardship efforts. Moreover, actively involving patients in conversations about antibiotic use and respecting their preferences can foster a sense of shared decision-making, which is associated with increased patient engagement and better health outcomes (Elwyn et al., 2012; Santana et al., 2018). Such a perception aligns with the idea about person-centered care, which emphasizes the importance of acknowledging patients' concerns and experiences to build trust (Ekman and Swedberg, 2022; Ridd et al., 2009; Santana et al., 2018). However, the findings also revealed significant challenges in building trust, especially in the context of power dynamics within healthcare settings. The findings indicated that the hierarchical nature of healthcare interactions, where physicians and pharmacists hold positions of authority, could hinder open communication with patients. This power imbalance was found to affect both the trust patients have in healthcare professionals and the effectiveness of educational efforts. In line with Bourdieu's concept of cultural and symbolic capital (Bourdieu, 1984), the study's findings suggest that healthcare professionals' authority can create an asymmetry in patient interactions, reducing opportunities for shared decision-making and undermining the patient's active role in their treatment. This contrasts with the person-centered approach that the study highlights as being essential for better patient engagement in AMR stewardship. The current study not only confirmed the importance of trust but also revealed how structural and power dynamics within healthcare settings, rooted in the biomedical perspective, may limit the achievement of successful patient education and antibiotic stewardship. These findings resonate with Foucault's concept of the 'medical gaze,' which suggests that the dominance of healthcare professionals' authority often reframes patient narratives to fit within a biomedical framework, overlooking non-biomedical dimensions of their experiences (Foucault, 2003). Such power dynamics can reduce patients' agency, thereby affecting the trust required for successful patient education on antibiotics and AMR. In healthcare contexts, patient encounters tend to be more 'medical/

professional-oriented' than 'patient/person-oriented' as they prioritize diagnosing and prescribing over a holistic approach, leading to an asymmetric power structure in primary healthcare (Misselbrook, 2013; Glasdam et al., 2020).

The results showed that pharmacists who adopted informal communication styles were more successful in building relationships with patients, where inconsistent communication between primary care physicians and pharmacists complicated these dynamics. This inconsistency in information exchange regarding antibiotic treatments could undermine patients' confidence, creating confusion about treatment plans and antibiotic use. Previous literature suggests that this could stem from differing professional positions, roles and responsibilities, and a lack of collaboration between healthcare professionals, highlighting the need for a unified approach to antibiotic stewardship (Balea and Glasdam, 2024; Reeves et al., 2017). Moreover, in line with previous literature, collaboration is embedded in hierarchical structures (Essex et al., 2023). The issue of perceived power asymmetry raises questions about whether healthcare professionals always recognize the impact of their authority on patient interactions. Previous literature shows that failing to address patients' concerns may diminish trust (Epstein and Street, 2011). This could explain why some patients were less receptive to educational messages about antibiotic use and AMR stewardship, as highlighted in our findings. This study is, however, limited by its lack of focus on patients' attitudes, knowledge levels, and cultural values. Stewart et al. (2022) argue that patient adherence is influenced by both motivation and ability. Some studies highlight that many young people are inadequately informed about antibiotic treatment and antimicrobial resistance (AMR), often perceiving antibiotics as a universal remedy and demonstrating limited understanding of the differences between viral and bacterial infections (Crago et al., 2022; Hawking et al., 2017). Conversely, other studies suggest that attitudes towards antibiotic treatments and AMR prevention are not necessarily age-dependent (e.g., Zaykova et al., 2022) but are instead shaped by cultural and social factors (Dionisio et al., 2023; Minnssen et al., 2020). This underscores the need for future research to adopt relational perspectives on antibiotic treatment and AMR stewardship, focusing on interactions between healthcare professionals and patients from both perspectives.

The results mainly focused on primary care physicians working as primary care physicians' and pharmacists' patient education about antibiotics and AMR. The literature searches did not identify any publications that addressed nurses' patient education about antibiotic treatment or AMR stewardship in home care and nursing home settings, which are significant areas within primary care. In primary care, including nursing homes, nurses meet patients with infections, treated with antibiotics or not (Alberg et al., 2017; Tark et al., 2020). The current review only found studies about nurses' patient education concerning prescription. However, follow-up education during treatment and AMR preventive initiatives may also be important tasks for nurses in primary care, which calls for future studies. Nurses, among other healthcare professionals, play a major role when it comes to the spreading of infections and the

development/stewardship of AMR (Glasdam et al., 2021; Singh et al., 2022), as they act as carriers and thereby transmit resistant bacteria to patients (Fracarolli et al., 2017; de Oliveira et al., 2012).

Furthermore, the results suggested that structural challenges, such as time pressures, heavy workloads, and the commercial nature of pharmacies and general practices, often hinder healthcare professionals from providing detailed patient education, leading to gaps in understanding of both treatment and prevention of AMR. Time constraints are among the most significant barriers healthcare professionals face today (Kasse et al., 2024; Lansink et al., 2024), directly impacting professionals' ability to provide comprehensive patient education about antibiotic use (Bosley et al., 2018). As the current results showed, primary care physicians often managed large numbers of patients daily, leaving insufficient time for thorough conversations about whether antibiotics were necessary for a given condition. Consequently, patients may not fully understand why antibiotics are being withheld, leading to frustration or demands for unnecessary prescriptions. The desire to increase patient turnover, in line with commercial goals, was evident in the current results, limiting the duration and quality of consultations. Pharmacists in commercially driven settings faced the dual challenge of high patient demand and the pressure to maintain profitability. While pharmacists were tasked with counselling patients on safe medication use, including antibiotics, their ability to provide detailed guidance was compromised by the need to meet sales targets. The prioritization of profitability over patient care may lead to less time spent educating patients about the risks of antibiotic misuse (Balea and Glasdam, 2024). In such profit-oriented environments, the commercial pressures conflict with the professional responsibility as healthcare professionals may feel driven to maximize income at the expense of providing adequate patient education (Balea and Glasdam, 2024; Saleh et al., 2021). The pursuit of financial success, therefore, further complicates efforts to combat AMR, as pharmacists and primary care physicians may be incentivized to prioritize sales/number of consultations over detailed patient education.

Moreover, the global shortage of primary care physicians exacerbates this problem. In many parts of the world, the demand for healthcare professionals far exceeds supply, resulting in overwhelmed primary care physicians who must see more patients in less time (Shen et al., 2020; Velgan et al., 2023). This shortage amplifies the pressures to balance patient care with business success, particularly in private practices where primary care physicians must manage the financial sustainability of their operations. The drive to earn more money can increase patient throughput, limiting the time available for important discussions about antibiotic use and AMR prevention.

These findings underscore the persistent tension between the demands of efficient healthcare delivery and the ethical responsibility to provide thorough patient care, which can lead to unnecessary prescriptions and contribute to the AMR crisis (Cutrell and Sanders, 2024; Pokharel et al., 2024). The findings highlight a central challenge in modern healthcare: balancing the commercial aspects of healthcare provision with the moral obligation to uphold the principles of the Hippocratic Oath as interpreted in the Geneva

Declaration (World Medical Association, 2017) and the medical ethical principle, especially the duty to 'do no harm' (Varkey, 2021). This tension is particularly evident in the context of AMR and the roles of primary care physicians and pharmacists in ensuring proper antibiotic stewardship. At the heart of this dilemma is also the desire of healthcare professionals to achieve financial success in their business (Noor et al., 2022). The conflict between profitability and patient care invites reflection on how healthcare systems might address the balance so as not to harm the patient in the first instance, and society at large by contributing to the development of AMR. However, the current findings also revealed that some primary care physicians and pharmacists were able to educate patients under the existing structural framework.

The results revealed the use of delayed prescriptions to balance the improvement of AMR stewardship and meeting patients' expectations for antibiotic treatment. Traditionally, physicians are the primary decision-makers and prescribers in antibiotic therapy (Carlsson et al., 2023). However, findings revealed a role inversion, shifting the basis of antibiotic stewardship from the expert, alias the physician, to the patient, thereby diminishing the professional autonomy, pointing to a form of de-professionalization of medicine (Engelhardt, 2002). This suggests that, in their efforts to maintain professional authority, physicians often rely on personal judgement, allowing external factors, such as patient preferences and concerns about risks of bacterial infection, to influence their decisions regarding antibiotic stewardship (Kasse et al., 2024; Lansink et al., 2024). This trend reflects broader challenges within healthcare, such as diagnostic uncertainties and time constraints, which can complicate the decision-making processes. While delayed prescriptions aim to reduce unnecessary antibiotic use, they also raise concerns about whether this approach may undermine professional responsibility and the authority of healthcare professionals in ensuring optimal antibiotic stewardship (McLeod et al., 2024).

Davari et al. (2018) state that, in practice, physicians' prescribing decisions are influenced by numerous factors, including clinical uncertainties, comorbidities, and patient expectations. When faced with unclear diagnoses or fear of complications, physicians may shift from clinical guidelines to a more individualized approach, as Md Rezal et al. (2015) demonstrate, despite acknowledging guidelines, many physicians deviate due to pressures like patient demands or diagnostic uncertainty. Similarly, McCullough et al. (2017) found a gap between guideline recommendations and actual prescribing rates, particularly for respiratory infections. Not all healthcare settings universally provide or follow detailed guidelines, as their availability often depends on the healthcare system's resources (Balea and Glasdam, 2024; Gu et al., 2022). Even when available, guidelines may not always be the most appropriate solution in every clinical scenario (Pouwels et al., 2019). To address these challenges, it is essential to maintain an up-to-date knowledge base and develop robust patient-provider relationships along with person-centered communication strategies. These measures may support both healthcare professionals and patients in making qualified and informed decisions about when antibiotics are truly necessary. Ultimately, such approaches could enhance efforts to prevent

AMR at both individual and societal levels. Moreover, Spurling et al. (2017) warn that inconsistencies in antibiotic stewardship, reducing the effectiveness of evidence-based practices in managing AMR, risks weakening the overall efforts to maintain a clear and effective strategy against AMR, locally, nationally, and internationally. Hence, the current study calls for re-evaluation and development of healthcare policies prioritizing commercial interests and financial success over patient care, ensuring that ethical standards remain central to healthcare provision generally and specifically in relation to antibiotic treatment and AMR stewardship in primary care settings.

Finally, the current study's method has strengths and limitations. The study's multifaceted approach enhances the analysis and fosters a more robust, effective, and sustainable understanding of how professionals educate patients about antibiotic treatment and the prevention of AMR. The review was conducted following the PRISMA 2020 guidelines, ensuring a transparent, thorough, and accurate presentation of the methods, which supports the assessment of its quality (Garcia-Doval et al., 2017; Page et al., 2021). Additionally, the review was pre-registered on PROSPERO, providing access to the protocol and enabling a comparison between the registered elements and the final manuscript, thereby enhancing transparency (Schiavo, 2019). The construction of the search strings yielded a high volume of hits. The Boolean operator 'NOT' was deliberately avoided to prevent the exclusion of potentially relevant studies. As a result, filters for terms such as hospital*, quantitative stud* and dental care were not applied. Consequently, an extensive manual screening was required to identify the relevant articles. The systematic search was conducted with the support of an experienced university librarian to retrieve the most relevant and comprehensive literature aligned with the study's aim, ensuring a systematic and transparent process. The screening process, data extraction and analysis were carried out alongside regular evaluations and discussions among all authors, further enhancing the study's credibility. The included studies were assessed as being of moderate to high quality using the CASP qualitative study checklist, ensuring the findings' credibility and relevance to the review's aim. However, the chosen checklist can be criticized for not including a question regarding the studies' underlying theoretical, ontological, and epistemological framework, which is also essential for assessing the quality of the studies (Long et al., 2020). Another limitation of the current study is that the review only included studies published in English, Scandinavian or Romanian, potentially excluding valuable perspectives presented in other languages. While the representation of 38 different countries in this study is a strength, the selected language may limit the transferability of the findings to other contexts. Furthermore, the limitations identified in the included studies, such as small sample sizes and unspecified healthcare professionals, are also considered limitations in the current literature review. A limitation is also the variation in national regulations on antibiotic use across the included studies. Different prescribing practices and antibiotic stewardship policies can affect the results, making it harder to compare findings and apply them to regions with different regulations.

Conclusion

Focusing on primary care settings, the findings of this systematic review highlighted the complexity healthcare professionals face in educating patients about antibiotic use and AMR, with each profession—physicians, pharmacists, and nurses encountering unique challenges. These challenges went beyond the clinical levels, involving relational, social and personal levels. While many physicians focused on building trust and shared decision-making, although struggling with time constraints and patient expectations, pharmacists often played a key role in providing accessible advice. However, they were limited by commercial pressures and a lack of patient medical history, which impacted their ability to offer thorough education. Nurses, though less involved in prescribing, were essential in reinforcing antibiotic treatments. Relationally, the interactions between healthcare professionals and patients/other healthcare professionals were influenced by power dynamics, trust issues, and inconsistent communication. These factors often hindered the effectiveness of educational efforts regarding antibiotic use and AMR stewardship. Moreover, many patients felt dissatisfied when the provided consultations were rushed, or their questions remained unanswered, which could lead to confusion and possible misuse of antibiotics. In primary care, physicians, pharmacists and nurses operated within structural frameworks influenced by time pressures, heavy workloads, and commercial demands, limiting their capacity to provide detailed patient education. These demands made it difficult for them to meet their ethical responsibilities. On a personal level, they faced the challenge of acting on behalf of patients' health while also managing the fear of losing patients or being perceived negatively if they did not prescribe antibiotics, even when they were aware it was not medically necessary.

Although often articulated as the most important act against the AMR crisis, this study demonstrated that providing adequate education on antibiotic use and AMR was not a straightforward path with simple solutions. Instead, it required acknowledging the multifaceted challenges that physicians, pharmacists and nurses faced on a daily basis. The complexity of these relational, social, and personal factors meant that there was no 'quick fix' through the implementation of evidence-based interventions alone. Future research and policymaking should focus on understanding these dynamics and creating environments that better support healthcare professionals in educating patients and tackling AMR. Given the limited research on nurses identified in this study, future studies should focus on the role of this professional group in antibiotic stewardship.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

LB: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. RG: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. HX: Writing – original draft, Writing – review & editing, Conceptualization, Methodology. SG: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Formal analysis, Project administration, Supervision.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Acknowledgments

The authors thank Krister Aronsson (Librarian at support for research and learning, Library & ICT, Faculty of Medicine, Lund University) for his dedicated assistance and work in designing and performing the literature searches.

References

- Alberg, T., Holen, Ø., Blix, H. S., Lindbæk, M., Bentele, H., and Eriksen, H. M. (2017). Antibiotic use and infections in nursing homes. *Antibiotikabruk og infeksjoner i sykehjem. Tidsskrift den Norske laegeforening: Tidsskrift Praktisk Medicin* 137, 357–361. doi: 10.4045/tidsskr.16.0621
- Alhomoud, F., Almahasnah, R., and Alhomoud, F. K. (2018). You could lose when you misuse" - factors affecting over-the-counter sale of antibiotics in community pharmacies in Saudi Arabia: A qualitative study. *BMC Health Serv. Res.* 18, 915. doi: 10.1186/s12913-018-3753-y
- Alkadhimi, A., Dawood, O. T., and Hassali, M. A. (2020). Dispensing of antibiotics in community pharmacy in Iraq: A qualitative study. *Pharm. Pract. (Granada)* 18, 2095. doi: 10.18549/PharmPract.2020.4.2095
- Alkirawan, R., Kawous, R., Bloemen, E., van den Muijsenbergh, M., Goosen, S., Suurmond, J., et al. (2022). Perspectives of Syrian refugees on antibiotic use and prescribing in Dutch primary care: a qualitative study. *Int. J. Migration Health Soc. Care* 18, pp.153163. doi: 10.1108/IJMHS-12-2021-0112
- Alves, P. G., Hayward, G., Leydon, G., Barnes, R., Woods, C., Webb, J., et al. (2021). Antibiotic prescribing in UK out-of hours primary care services: A realist-informed scoping review of training and guidelines for healthcare professionals. *BJGP Open* 5, BJGPO.2020.0167. doi: 10.3399/BJGPO.2020.0167
- Alzard, S., Wen, J., Huynh, N. P. Q., Shirkhazadeh, S., Tso, J. Y., Rabino, M., et al. (2024). Opportunities and barriers to pediatric antimicrobial stewardship by community pharmacists. *J. Pediatr. Infect. Dis. Soc.* 13, pp.313–pp.316. doi: 10.1093/jpids/piae039
- Amin, M. E. K., Amine, A., and Newegy, M. S. (2017). Perspectives of pharmacy staff on dispensing subtherapeutic doses of antibiotics: A theory-informed qualitative study. *Int. J. Clin. Pharm.* 39, 1110–1118. doi: 10.1007/s11096-017-0510-y
- Anderson, E. C., Kesten, J. M., Lane, I., Hay, A. D., Moss, T., and Cabral, C. (2019). Primary care clinicians' views of pediatric respiratory infection surveillance information to inform clinical decision making: A qualitative study. *BMJ Pediatr. Open* 3, e000418. doi: 10.1136/bmjpo-2018000418
- Andersson, M., Schulze, K., Cassini, A., Plachouras, D., and Mossialos, E. (2019). A governance framework for development and assessment of national action plans on antimicrobial resistance. *Lancet Infect. Dis.* 19, e371–e384. doi: 10.1016/S1473-3099(19)30415-3
- Antimicrobial Resistance Collaborators (2022). Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. *Lancet* 399, 629–655. doi: 10.1016/S01406736(21)02724-0
- Aponte-González, J., González-Acuña, A., Lopez, J., Brown, P., and Eslava-Schmalbach, J. (2019). Perceptions in the community about the use of antibiotics without a prescription: Exploring ideas behind this practice. *Pharm. Pract.* 17, 1394. doi: 10.18549/PharmPract.2019.1.1394

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Arnau-Sánchez, J., Jiménez-Guillén, C., Alcaraz-Quionero, M., Viguera-Abellán, J. J., GarnicaMartínez, B., Soriano-Ibarra, J. F., et al. (2023). Factors influencing inappropriate use of antibiotics in infants under 3 years of age in primary care: A qualitative study of the pediatricians' perceptions. *Antibiotics* 12, 727. doi: 10.3390/antibiotics12040727
- Ashdown, H. F., Räisänen, U., Wang, K., Ziebland, S., and Harnden, A. (2021). Prescribing antibiotics to 'at-risk' children with influenza-like illness in primary care: qualitative study. *BMJ Open* 6, e011497. doi: 10.1136/bmjopen-2016-011497
- Atif, M., Asghar, S., Mushtaq, I., and Malik, I. (2020). Community pharmacists as antibiotic stewards: A qualitative study exploring the current status of Antibiotic Stewardship Program in Bahawalpur, Pakistan. *J. Infection Public Health* 13, 118–124. doi: 10.1016/j.jiph.2019.07.003
- Balea, L. B., and Glasdam, S. (2024). Practices, strategies, and challenges in antibiotic treatment and prevention of antimicrobial resistance from the perspectives of Romanian community pharmacists and general practitioners. *Front. Antibiotics* 3. doi: 10.3389/frabi.2024.1439688
- Bergsholm, Y. K. R., Feiring, M., Charnock, C., Holm, L. B., and Krogstad, T. (2023a). Exploring patients' adherence to antibiotics by understanding their health knowledge and relational communication in encounters with pharmacists and physicians. *Exploratory Res. Clin. Pharm.* 12, 100372. doi: 10.1016/j.rcsop.2023.100372
- Bergsholm, Y. K. R., Feiring, M., Charnock, C., Krogstad, T., and Holm, L. B. (2023b). Positioning of community pharmacists in interactions with general practitioners and patients regarding prescribing and using antibiotics. *J. Interprofessional Care* 37, 886–895. doi: 10.1080/13561820.2023.2203698
- Bettany-Saltikov, J., and McSherry, R. (2016). *How to do a systematic literature review in nursing: A step by-step guide. 2nd* (London: Open University Press).
- Biezen, R., Brijnath, B., Grando, D., and Mazza, D. (2017). Management of respiratory tract infections in young children-A qualitative study of primary care providers' perspectives. *NPJ Primary Care Respir. Med.* 27, 15. doi: 10.1038/s41533-017-0018-x
- Biezen, R., Grando, D., Mazza, D., and Brijnath, B. (2019). Dissonant views - GPs' and parents' perspectives on antibiotic prescribing for young children with respiratory tract infections. *BMC Family Pract.* 20, 46. doi: 10.1186/s12875-019-0936-5
- Bisgaard, L., Andersen, C. A., Jensen, M. S. A., Bjerrum, L., and Hansen, M. P. (2021). Danish GPs' experiences when managing patients presenting to general practice with symptoms of acute lower respiratory tract infections: A qualitative study. *Antibiotics (Basel)* 10, 661. doi: 10.3390/antibiotics10060661
- Black, E., Cartwright, A., Bakharaiba, S., Al-Mekaty, E., and Alsahan, D. (2014). A qualitative study of pharmacists' perceptions of, and recommendations for improvement of antibiotic use in Qatar. *Int. J. Clin. Pharm.* 36, 787–794. doi: 10.1007/s11096-014-9960-7

- Bless, P. J., Muela Ribera, J., Schmutz, C., Zeller, A., and Mäusezahl, D. (2016). Acute gastroenteritis and campylobacteriosis in Swiss primary care: The viewpoint of general practitioners. *PLoS One* 11, e0161650. doi: 10.1371/journal.pone.0161650
- Boaitey, K. P., Hoffmann, T., Baillie, E., and Bakht, M. (2023). Exploring general practitioners' perception of the value of natural history information and their awareness and use of guidelines' resources to support antibiotic prescribing for self-limiting infections: A qualitative study in Australian general practice. *Aust. J. Primary Health* 29, 558–565. doi: 10.1071/PY22258
- Boiko, O., Burgess, C., Fox, R., Ashworth, M., and Gulliford, M. C. (2020). Risks of use and non-use of antibiotics in primary care: Qualitative study of prescribers' views. *BMJ Open* 10, e038851. doi: 10.1136/bmjopen-2020-038851
- Bordado Sköld, M., Aabenhus, R., Guassora, A. D., and Mäkelä, M. (2017). Antibiotic treatment failure when consulting patients with respiratory tract infections in general practice. A qualitative study to explore Danish general practitioners' perspectives. *Euro. J. General Practice* 23, 121–128. doi: 10.1136/bmjopen-2020-038851
- Bosley, H., Henshall, C., Appleton, J. V., and Jackson, D. (2018). A systematic review to explore influences on parental attitudes towards antibiotic prescribing in children. *J. Clin. Nurs.* 27, e861–e885. doi: 10.1111/jocn.14266
- Bosley, H., Henshall, C., Appleton, J. V., and Jackson, D. (2021). Mixed methods case study exploring primary care antibiotic prescribing practices and maternal expectations of using antibiotics in children. *Contemp. Nurse* 57, 245–257. doi: 10.1080/10376178.2021.1994865
- Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste* (Cambridge, MA: Harvard University Press).
- Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qual. Res. Psychol.* 3, 77–101. doi: 10.1191/1478088706qp0630a
- Brisley, A., Lambert, H., and Rodrigues, C. (2023). Antibiotics in Catalan primary care: Prescription, use and remedies for a crisis of care. *Med. Anthropology* 42, 682–696. doi: 10.1080/01459740.2023.2256451
- Brookes-Howell, L., Wood, F., Verheij, T., Prout, H., Cooper, L., Hood, K., et al. (2014). Trust, openness and continuity of care influence acceptance of antibiotics for children with respiratory tract infections: A four country qualitative study. *Family Pract.* 31, 102–110. doi: 10.1093/fampra/cmt052
- Burnett, E. (2018). Effective infection prevention and control: The nurse's role. *Nurs. Standard* 33, 68–72. doi: 10.7748/ns.2018.e11171
- Cabral, C., Ingram, J., Hay, A. D., Horwood, J., and TARGET team (2014). They just say everything's a virus"—Parents' judgment of the credibility of clinician communication in primary care consultations for respiratory tract infections in children: A qualitative study. *Patient Educ. Couns.* 95, 248–253. doi: 10.1016/j.pcc.2014.01.010
- Cabral, C., Ingram, J., Lucas, P. J., Redmond, N. M., Kai, J., Hay, A. D., et al. (2016). Influence of clinical communication on parents' antibiotic expectations for children with respiratory tract infections. *Ann. Family Med.* 14, 141–147. doi: 10.1370/afm.1892
- Camerini, F. G., Cunha, T. L., Fassarella, C. S., de Mendonça Henrique, D., and Fortunato, J. G. S. (2024). Nursing strategies in antimicrobial stewardship in the hospital environment: A qualitative systematic review. *BMC Nurs.* 23, 147. doi: 10.1186/s12912-024-01753-y
- Carlsson, F., Jacobsson, G., and Lampi, E. (2023). Antibiotic prescription: Knowledge among physicians and nurses in western Sweden. *Health Policy* 130, 104733. doi: 10.1016/j.healthpol.2023.104733
- Center for Disease Dynamics, Economics and Policy (2015). *State of the world's antibiotic* (Washington, D.C.: CDDEP).
- Colliers, A., Coenen, S., Bombeke, K., Remmen, R., Philips, H., and Anthierens, S. (2020). Understanding general practitioners' antibiotic prescribing decisions in out-of-hours primary care: A video elicitation interview study. *Antibiotics (Basel)* 9, 115. doi: 10.3390/antibiotics9030115
- Colliers, A., Coenen, S., Remmen, R., Philips, H., and Anthierens, S. (2018). How do general practitioners and pharmacists experience antibiotic use in out-of-hours primary care? An exploratory qualitative interview study to inform a participatory action research project. *BMJ Open* 8, e023154. doi: 10.1136/bmjopen-2018-023154
- Courtenay, M., Rowbotham, S., Lim, R., Deslandes, R., Hodson, K., MacLure, K., et al. (2017). Antibiotics for acute respiratory tract infections: A mixed-methods study of patient experiences of non-medical prescriber management. *BMJ Open* 7, e013515. doi: 10.1136/bmjopen-2016-013515
- Courtenay, M., Rowbotham, S., Lim, R., Peters, S., Yates, K., and Chater, A. (2019). Examining influences on antibiotic prescribing by nurse and pharmacist prescribers: A qualitative study using the Theoretical Domains Framework and COM-B. *BMJ Open* 9, e029177. doi: 10.1136/bmjopen-2019029177corr1
- Cox, S., Vleeming, M., Giorgi, W., Dinant, G. J., Cals, J., and de Bont, E. (2023). Patients' experiences, expectations, motivations, and perspectives around urinary tract infection care in general practice: A qualitative interview study. *Antibiotics (Basel)* 12, 241. doi: 10.3390/antibiotics12020241
- Crago, A.-L., Alexandre, S., Abdesselam, K., Tropper, D. G., Hartmann, M., Smith, G., et al. (2022). Understanding Canadians' knowledge, attitudes and practices related to antimicrobial resistance and antibiotic use: Results from public opinion research. *Canada Communicable Dis. Rep.* 48, 550–558. doi: 10.14745/ccdr.v48i112a08
- Critical Appraisal Skills Program (2018). *CASP qualitative checklist*. (Oxford). Available at: <https://casputk.net/casp-tools-checklists/> (Accessed August 20, 2024).
- Cutrell, J. B., and Sanders, J. M. (2024). How should clinicians navigate interprofessional tension in their roles as antimicrobial stewards? *AMA J. Ethics* 26, E441–E447. doi: 10.1001/amajethics.2024.441
- Dallas, A., Davey, A., Mulquaney, K., Davis, J., Glasziou, P., Van Driel, M., et al. (2020). Delayed prescribing of antibiotics for acute respiratory infections by GP registrars: A qualitative study. *Family Pract.* 37, 406–411. doi: 10.1093/fampra/cmz079
- Darj, E., Newaz, M. S., and Zaman, M. H. (2019). Pharmacists' perception of their challenges at work, focusing on antimicrobial resistance: A qualitative study from Bangladesh. *Global Health Action* 12, p. doi: 10.1080/16549716.2020.1735126
- Davari, M., Khorasani, E., and Tigabu, B. M. (2018). Factors influencing prescribing decisions of physicians: A review. *Ethiopian J. Health Sci.* 28, 795–804. doi: 10.4314/ejhs.v28i6.15
- Dempsey, P. P., Businger, A. C., Whaley, L. E., Gagne, J. J., and Linder, J. A. (2014). Primary care clinicians' perceptions about antibiotic prescribing for acute bronchitis: A qualitative study. *BMC Family Pract.* 15, 194. doi: 10.1186/s12875-014-0194-5
- de Oliveira, A. C., Medeiros Silva, M. D., and Garbaccio, J. L. (2012). Clothing of health care professional as potential reservoirs of micro-organisms: An integrative review. *Texto Contexto Enfermagem* 21, 684–691. doi: 10.1590/S0104-07072012000300025
- Dionisio, F., Baquero, F., and Fuertes, M. (2023). Psychological and cultural factors influencing antibiotic prescription. *Trends Microbiol.* 31, 559–570. doi: 10.1016/j.tim.2022.12.010
- Duane, S., Domegan, C., Callan, A., Galvin, S., Cormican, M., Bennett, K., et al. (2016). Using qualitative insights to change practice: Exploring the culture of antibiotic prescribing and consumption for urinary tract infections. *BMJ Open* 6, e008894. doi: 10.1136/bmjopen2015-008894
- Durand, C., Chappuis, A., Douriez, E., Poulain, F., Ahmad, R., Lescure, F. X., et al. (2022). Perceptions, current practices, and interventions of community pharmacists regarding antimicrobial stewardship: A qualitative study. *J. Am. Pharmacist Assoc.* 62, 1239–1248.e1. doi: 10.1016/j.japh.2022.02.003
- Ekman, I., and Swedberg, K. (2022). "Person-centered care, theory, operationalization and effects," in *Intelligent systems for sustainable person-centered healthcare*, vol. 205. Eds. D. Kriksciuniene and V. Sakalauskas (Springer, Cham). doi: 10.1007/978-3-030-79353-1_2
- Elwyn, G., Frosch, D., Thomson, R., Joseph-Williams, N., Lloyd, A., Kinnersley, P., et al. (2012). Shared decision making: A model for clinical practice. *J. Gen. Internal Med.* 27, 1361–1367. doi: 10.1007/s11606-012-2077-6
- Engelhardt, H. T. (2002). "Managed care and the deprofessionalization of medicine," in *The ethics of managed care: Professional integrity and patient rights*. *Philosophy and Medicine*, vol. 76. Eds. W. B. Bondeson and J. W. Jones (Springer). doi: 10.1007/978-94-017-0413-7_7
- Epstein, R. M., and Street, R. L. Jr. (2011). The values and value of patient-centered care. *Ann. Family Med.* 9, 100–103. doi: 10.1370/afm.1239
- Essex, R., Kennedy, J., Miller, D., and Jameson, J. (2023). A scoping review exploring the impact and negotiation of hierarchy in healthcare organizations. *Nurs. Inq.* 30, 1–10. doi: 10.1111/nin.1257
- Essilini, A., Pierre, A., Bocquier, A., Pulcini, C., Wilcke, C., Gravoulet, J., et al. (2021). Community pharmacists' views on their current role and future opportunities for antibiotic stewardship: A French qualitative study. *JAC Antimicrobial Resistance* 3, dlab129. doi: 10.1093/jacamr/dlab129
- Fletcher-Lartey, S., Yee, M., Gaarslev, C., and Khan, R. (2016). Why do general practitioners prescribe antibiotics for upper respiratory tract infections to meet patient expectations: A mixed methods study. *BMJ Open* 6, e012244. doi: 10.1136/bmjopen-2016-012244
- Foucault, M. (2003). *The birth of the clinic. An archaeology of medical perception* (London: Routledge).
- Fracarolli, I. F. L., de Oliveira, S. A., and Marziale, M. H. P. (2017). Bacterial colonization and antimicrobial resistance in healthcare workers: An integrative review. *Acta Paulista Enfermagem* 30, 651–657. doi: 10.1590/1982-0194201700086
- Gaarslev, C., Yee, M., Chan, G., Fletcher-lartey, S., and Khan, R. (2016). A mixed methods study to understand patient expectations for antibiotics for an upper respiratory tract infection. *Antimicrobial Resistance Infection Control* 5, 39. doi: 10.1186/s13756-016-0134-3
- Garcia-Doval, I., van Zuuren, E. J., Bath-Hextall, F., and Ingram, J. R. (2017). Systematic reviews: Let's keep them trustworthy. *Br. J. Dermatol.* 177, 888–889. doi: 10.1111/bjd.15826
- Gautham, M., Bhattacharyya, S., Maity, S., Roy, M. B., Balasubramaniam, P., Ebata, A., et al. (2024). Just as curry is needed to eat rice, antibiotics are needed to cure fever"—A qualitative study of individual, community and health system-level influences on community antibiotic practices in rural West Bengal, India. *BMJ Open* 14, e076616. doi: 10.1136/bmjopen-2023076616
- Ghiga, I., Pitchforth, E., Stålsby Lundborg, C., and Machowska, A. (2023). Family doctors' roles and perceptions on antibiotic consumption and antibiotic resistance in Romania: A qualitative study. *BMC Primary Care* 24, p.93. doi: 10.1186/s12875-023-02047-z
- Ghiga, I., and Stålsby Lundborg, C. (2016). 'Struggling to be a defender of health' -A qualitative study on the pharmacists' perceptions of their role in antibiotic consumption and antibiotic resistance in Romania. *J. Pharm. Policy Pract.* 9, 10. doi: 10.1186/s40545-016-0061-y

- Giamarellou, H., Galani, L., Karavasilis, T., Ioannidis, K., and Karaiskos, I. (2023). Antimicrobial stewardship in the hospital setting: A narrative review. *Antibiotics* 12, 1557. doi: 10.3390/antibiotics12101557
- Gilham, E. L., Pearce-Smith, N., Carter, V., and Ashiru-Oredope, D. (2024). Assessment of global antimicrobial resistance campaigns conducted to improve public awareness and antimicrobial use behaviors: A rapid systematic review. *BMC Public Health* 24, 396. doi: 10.1186/s12889024-17766-w
- Glasdam, S., Ekstrand, F., Rosberg, M., and van der Schaaf, A. M. (2020). A gap between the philosophy and the practice of palliative healthcare: sociological perspectives on the practice of nurses in specialized palliative homecare. *Medicine Health care philosophy* 23, 141–152. doi: 10.1007/s11019-019-09918-2
- Glasdam, S., Loodin, H., and Wrigstad, J. (2021). Articulations of antimicrobial resistance in trade union financed journals for nurses in Scandinavia -A Foucauldian perspective. *Nurs. Inq.* 28, e12396. doi: 10.1111/nin.12396
- Grigoryan, L., Mulgirigama, A., Powell, M., and Schmiemann, G. (2022). The emotional impact of urinary tract infections in women: A qualitative analysis. *BMC Women's Health* 22, 182. doi: 10.1186/s12905-022-01757-3
- Gu, T., Li, W., Yang, L.-L., Yang, S.-M., He, Q., He, H.-Y., et al. (2022). Systematic review of guidelines for the diagnosis and treatment of *Clostridioides difficile* infection. *Front. Cell. Infection Microbiol.* 12. doi: 10.3389/fcimb.2022.926482
- Gualano, M. R., Gili, R., Scaioli, G., Bert, F., and Siliquini, R. (2015). General population's knowledge and attitudes about antibiotics: A systematic review and meta-analysis. *Pharmacoeconomics Drug Saf.* 24, 2–10. doi: 10.1002/pds.3716
- Gulliford, M. C., Charlton, J., Boiko, O., Winter, J. R., Rezel-Potts, E., Sun, X., et al. (2021). Safety of reducing antibiotic prescribing in primary care: a mixed-methods study. *NIHR Journals Library* 9 (9). doi: 10.3310/hsdr09090
- Guo, H., Hildon, Z. J., Loh, V. W. K., Sundram, M., Ibrahim, M. A. B., Tang, W. E., et al. (2021). Exploring antibiotic prescribing in public and private primary care settings in Singapore: A qualitative analysis informing theory and evidence-based planning for value-driven intervention design. *BMC Family Pract.* 22, 205. doi: 10.1186/s12875-021-01556-z
- Ha, D. R., Haste, N. M., and Gluckstein, D. P. (2017). The role of antibiotic stewardship in promoting appropriate antibiotic use. *Am. J. Lifestyle Med.* 13, 376–383. doi: 10.1177/1559827617700824
- Halls, A., Van't Hoff, C., Little, P., Verheij, T., and Leydon, G. M. (2017). Qualitative interview study of parents' perspectives, concerns and experiences of the management of lower respiratory tract infections in children in primary care. *BMJ Open* 7, e015701. doi: 10.1136/bmjopen-2016015701
- Hawking, M. K., Lecky, D. M., Touboul Lundgren, P., Aldigs, E., Abdulmajed, H., Ioannidou, E., et al. (2017). Attitudes and behaviors of adolescents towards antibiotics and self-care for respiratory tract infections: A qualitative study. *BMJ Open* 7, e015308. doi: 10.1136/bmjopen-2016-015308
- Heyman, G., Cars, O., Bejarano, M. T., and Peterson, S. (2014). Access, excess, and ethics—towards a sustainable distribution model for antibiotics. *Upsala J. Med. Sci.* 119, 134–141. doi: 10.3109/03009734.2014.904958
- Hika, K., Harwood, M., Ritchie, S., and Chan, A. H. Y. (2022). Māori experiences and beliefs about antibiotics and antimicrobial resistance for acute upper respiratory tract symptoms: A qualitative study. *Antibiotics* 11, p.714. doi: 10.3390/antibiotics11060714
- Hoang, D. T., McKinn, S., Drabarek, D., Thu Trieu, T., Thuy Pham, V., Ngoc Pham, Y., et al. (2024). [amp]When I tried to explain, they shouted back at me!': Exploring how community pharmacists navigate tensions implementing antimicrobial stewardship in Vietnam. *Crit. Public Health* 34, 1–14. doi: 10.1080/09581596.2024.2303421
- Horwood, J., Cabral, C., Hay, A. D., and Ingram, J. (2016). Primary care clinician antibiotic prescribing decisions in consultations for children with RTIs: A qualitative interview study. *Br. J. Gen. Pract.* 66, e207–e213. doi: 10.3399/bjgp16X683821
- Hu, X. Y., Logue, M., Maund, E., Santer, M., Willcox, M. L., Islam, S., et al. (2024). Pharmacists' perspectives on recommending herbal medicines for acute infections: A qualitative study. *BJGP Open* 8, BJGPO.2023.0138. doi: 10.3399/BJGPO.2023.0138
- Jakupi, A., Raka, D., Kaae, S., and Sporrang, S. K. (2019). Culture of antibiotic use in Kosovo - an interview study with patients and health professionals. *Pharm. Pract.* 17, 1540. doi: 10.18549/PharmPract.2019.3.1540
- Jones, L. F., Owens, R., Sallis, A., Ashiru-Oredope, D., Thornley, T., Francis, N. A., et al. (2018). Qualitative study using interviews and focus groups to explore the current and potential for antimicrobial stewardship in community pharmacy informed by the Theoretical Domains Framework. *BMJ Open* 8, e025101. doi: 10.1136/bmjopen-2018-025101
- Jorgoni, L., Camardo, E., Jeffs, L., Nakamachi, Y., Somanader, D., Bell, C. M., et al. (2022). Knowledge, perspectives and health outcome expectations of antibiotic therapy in hospitalized patients. *Infection Prev. Pract.* 4, 100245. doi: 10.1016/j.infpip.2022.100245
- Kaminsky, E., Aurin, I. E., Hedin, K., Andersson, L., and André, M. (2020). Registered nurses' views on telephone nursing for patients with respiratory tract infections in primary healthcare - A qualitative interview study. *BMC Nurs.* 19, 65. doi: 10.1186/s12912-020-00459-1
- Kasse, G. E., Humphries, J., and Cosh, S. M. (2024). Factors contributing to the variation in antibiotic prescribing among primary health care physicians: A systematic review. *BMC Primary Care* 25, 8. doi: 10.1186/s12875-023-02223-1
- Khan, F. U., Khan, F. U., Hayat, K., Ahmad, T., Khan, A., Chang, J., et al. (2021). Knowledge, attitude, and practice on antibiotics and its resistance: A two-phase mixed-methods online study among Pakistani community pharmacists to promote rational antibiotic use. *Int. J. Environ. Res. Public Health* 18, 1320. doi: 10.3390/ijerph18031320
- Khan, K. S., Kunz, R., Kleijnen, J., and Antes, G. (2004). *Systematic reviews to support evidence-based medicine: how to review and apply findings of healthcare research*. 2nd (London: The Royal Society of Medicine Press Limited).
- Khan, F. U., Mallhi, T. H., Khan, F. U., Hayat, K., Rehman, A. U., Shah, S., et al. (2022). Evaluation of consumers' perspective on the consumption of antibiotics, antibiotic resistance, and recommendations to improve the rational use of antibiotics: An exploratory qualitative study from post-conflicted region of Pakistan. *Front. Pharmacol.* 13. doi: 10.3389/fphar.2022.881243
- Knobloch, M. J., Musuuza, J., Baubie, K., Saban, K. L., Suda, K. J., and Safdar, N. (2021). Nurse practitioners as antibiotic stewards: Examining prescribing patterns and perceptions. *Am. J. Infection Control* 49, 1052–1057. doi: 10.1016/j.ajic.2021.01.018
- Korkmaz, P., Mistanoglu-Özatağ, D., Paşalı-Kilit, T., Toka, O., and Onbaşı, K. (2024). Knowledge and attitudes of patients about the rational use of antibiotics. *Infect. Dis. Clin. Microbiol.* 6, 11–21. doi: 10.36519/idcm.2024.305
- Kurotschka, P. K., Hemkeppler, J., Gierszewski, D., Ghirotto, L., and Gágyor, I. (2024). General practitioners' decision making managing uncomplicated urinary tract infections in women: A qualitative study. *BJGP Open* p, BJGPO.2023.0224. doi: 10.3399/BJGPO.2023.0224
- Lalithabai, D. S., Hababeh, M. O., Wani, T. A., and Aboshaiqah, A. E. (2022). Knowledge, attitude and beliefs of nurses regarding antibiotic use and prevention of antibiotic resistance. *SAGE Open Nurs.* 8, 1–9. doi: 10.1177/23779608221076821
- Lambert, M., Wonink, A., Benko, R., Plejdrup Hansen, M., van Dijk, L., and Taxis, K. (2024). Pharmacists combating antimicrobial resistance: A Delphi study on antibiotic dispensing. *Res. Soc. Administrative Pharm.* 20 (8), S1551–7411(24)00120-7. doi: 10.1016/j.sapharm.2024.04.006
- Lansink, C., Sinha, B., Meessen, N., Dekkers, T., and Beerlage-de Jong, N. (2024). Why do physicians prescribe antibiotics? A systematic review of the psycho-social-organizational factors related to potentially inappropriate prescribing of antimicrobials in Europe. *Infect. Dis. Rep.* 16, 664–683. doi: 10.3390/idr16040051
- Laytner, L., Chen, P., Nash, S., Paasche-Orlow, M. K., Street, R., Zoorob, R., et al. (2023). Perspectives on non-prescription antibiotic use among Hispanic patients in the Houston Metroplex. *J. Am. Board Family Med.* 36, 390–404. doi: 10.3122/jabfm.2022.220416R1
- Lee, S. Y., Shanshan, Y., and Lwin, M. O. (2023). Are threat perceptions associated with patient adherence to antibiotics? Insights from a survey regarding antibiotics and antimicrobial resistance among the Singapore public. *BMC Public Health* 23, 1–8. doi: 10.1186/s12889-023-15184y
- Lescure, D. L. A., van Oorschot, W., Brouwer, R., van der Velden, J., Tjon-A-Tsien, A. M. L., Bonnema, I. V., et al. (2022). Providing antibiotics to immigrants: A qualitative study of general practitioners' and pharmacists' experiences. *BMC Primary Care* 23, 100. doi: 10.1186/s12875-022-01706-x
- Lim, K., Broom, A., Olsen, A., and Seale, H. (2022). Community pharmacists as antimicrobial guardians and gatekeepers - A qualitative study of the perspectives of pharmacy sector stakeholders. *Exploratory Res. Clin. Soc. Pharm.* 9, 100212. doi: 10.1016/j.rcsop.2022.100212
- Lipstein, E. A., Block, J. P., Dodds, C., Forrest, C. B., Heerman, W. J., Law, J. K., et al. (2019). Early antibiotics and childhood obesity: Do future risks matter to parents and physicians? *Clin. Pediatr.* 58, 191–198. doi: 10.1177/000922818809534
- Long, H. A., French, D. P., and Brooks, J. M. (2020). Optimizing the value of the critical appraisal skills program (CASP) tool for quality appraisal in qualitative evidence synthesis. *Res. Methods Med. Health Sci.* 1, 31–42. doi: 10.1177/2632084320947559
- Lum, E. P. M., Page, K., Nissen, L., Doust, J., and Graves, N. (2017). Australian consumer perspectives, attitudes and behaviors on antibiotic use and antibiotic resistance: A qualitative study with implications for public health policy and practice. *BMC Public Health* 17, 799. doi: 10.1186/s12889-017-4813
- Lum, E. P. M., Page, K., Whitty, J. A., Doust, J., and Graves, N. (2018). Antibiotic prescribing in primary healthcare: Dominant factors and trade-offs in decision-making. *Infect. Dis. Health* 23, 74–86. doi: 10.1016/j.idh.2017.12.002-7
- Mahmoud, M. A., Aldhaeefi, M., Sheikh, A., and Aljadhey, H. (2018). Community pharmacists' perspectives about reasons behind antibiotics dispensing without prescription: A qualitative study. *Biomed. Res.* 29, 3792–3796. doi: 10.4066/biomedicalresearch.29-18-1112
- Manderson, L. (2020). Prescribing, care and resistance: Antibiotic use in urban South Africa. *Humanities Soc. Sci. Commun.* 7, 77. doi: 10.1057/s41599-020-00564-1
- Mas-Dalmau, G., Pequeño-Saco, S., de la Poza-Abad, M., Borrell-Thió, E., Besa-Castellà, M., Alsina-Casaldueiro, M., et al. (2023). Perceptions and attitudes regarding delayed antibiotic prescription for respiratory tract infections: A qualitative study. *BMC Primary Care* 24, 204. doi: 10.1186/s12875-023-02123-4
- McCubbin, K. D., Anholt, R. M., de Jong, E., Ida, J. A., Nóbrega, D. B., Kastelic, J. P., et al. (2021). Knowledge gaps in the understanding of antimicrobial resistance in Canada. *Front. Public Health* 9. doi: 10.3389/fpubh.2021.726484
- McCullough, A. R., Pollack, A. J., Plejdrup Hansen, M., Glasziou, P. P., Looke, D. F., Britt, H. C., et al. (2017). Antibiotics for acute respiratory infections in general practice: Comparison of prescribing rates with guideline recommendations. *Med. J. Aust.* 207, 65–69. doi: 10.5694/mja16.01042

- McDermott, L., Leydon, G. M., Halls, A., Kelly, J., Nagle, A., White, J., et al. (2017). Qualitative interview study of antibiotics and self-management strategies for respiratory infections in primary care. *BMJ Open* 7, e016903. doi: 10.1136/bmjopen-2017-016903
- McLeod, M., Campbell, A., Hayhoe, B., Borek, A. J., Tonkin-Crine, S., Moore, M. V., et al. (2024). How, why and when are delayed (back-up) antibiotic prescriptions used in primary care? A realist review integrating concepts of uncertainty in healthcare. *BMC Public Health* 24, 2820. doi: 10.1186/s12889-024-20248-8
- McNulty, C. A., Lecky, D. M., Hawking, M. K., Roberts, C., Quigley, A., and Butler, C. C. (2016). How much information about antibiotics do people recall after consulting in primary care? *Family Pract.* 33, 395–400. doi: 10.1093/fampra/cmww022
- Md Rezal, R. S., Hassali, M. A., Alrasheedy, A. A., Saleem, F., Md Yusof, F. A., and Godman, B. (2015). Physicians' knowledge, perceptions and behavior towards antibiotic prescribing: A systematic review of the literature. *Expert Rev. Anti-infective Ther.* 13, 665–680. doi: 10.1586/14787210.2015.1025057
- Medina-Perucha, L., Garcia-Sangenis, A., Moragas, A., Gálvez-Hernández, P., Cots, J. M., Lanau-Roig, A., et al. (2020). Autonomy, power dynamics and antibiotic use in primary healthcare: A qualitative study. *PLoS One* 15, e0244432. doi: 10.1371/journal.pone.0244432
- Miller, B. J., Carson, K. A., and Keller, S. (2020). Educating patients on unnecessary antibiotics: Personalizing potential harm aids patient understanding. *J. Am. Board Family Medicine: JABFM* 33, 969–977. doi: 10.3122/jabfm.2020.06.200210
- Minssen, T., Outterson, K., Rogers Van Katwyk, S., Batista, P. H. D., Chandler, C. I. R., Ciabuschi, F., et al. (2020). Social, cultural and economic aspects of antimicrobial resistance. *Bull. World Health Organ.* 98, 823–823A. doi: 10.2471/BLT.20.275875
- Misselbrook, D. (2013). Foucault. *Br. J. Gen. Pract.* 63, 312. doi: 10.3399/bjgp13X668249
- Mortazhejri, S., Patey, A. M., Stacey, D., Bhatia, R. S., Abdulla, A., and Grimshaw, J. M. (2020). Understanding determinants of patients' decisions to attend their family physician and to take antibiotics for upper respiratory tract infections: A qualitative descriptive study. *BMC Family Pract.* 21, 119. doi: 10.1186/s12875-020-01196-9
- Musoke, D., Lubega, G. B., Gbadesire, M. S., Boateng, S., Twesigye, B., Gheer, J., et al. (2023). Antimicrobial stewardship in private pharmacies in Wakiso district, Uganda: A qualitative study. *J. Pharm. Policy Pract.* 16, 147. doi: 10.1186/s40545-023-00659-5
- Mustafa, M., Wood, F., Butler, C. C., and Elwyn, G. (2014). Managing expectations of antibiotics for upper respiratory tract infections: A qualitative study. *Ann. Family Med.* 12, 29–36. doi: 10.1370/afm.1583
- Ness, V., Price, L., Currie, K., and Reilly, J. (2014). Antimicrobial resistance and prescribing behavior. *Nurse Prescribing* 12, 248–253. doi: 10.12968/npre.2014.12.5.248
- Nieuwlaat, R., Wilczynski, N., Navarro, T., Hobson, N., Jeffery, R., Keenanasseril, A., et al. (2014). Interventions for enhancing medication adherence. *Cochrane Database Systematic Rev.* 2014, CD000011. doi: 10.1002/14651858.CD000011.pub4
- Noor, M. N., Liverani, M., Bryant, J., Rahman-Shepherd, A., Sharif, S., Aftab, W., et al. (2022). The healthcare field as a marketplace: General practitioners, pharmaceutical companies, and profit-led prescribing in Pakistan. *Health Sociology Rev.* 32, 198–212. doi: 10.1080/14461242.2022.2139628
- O'Doherty, J., Leader, L. F. W., O'Regan, A., Dunne, C., Puthooppambal, S. J., and O'Connor, R. (2019). Over prescribing of antibiotics for acute respiratory tract infections: A qualitative study to explore Irish general practitioners' perspectives. *BMC Family Pract.* 20, 27. doi: 10.1186/s12875019-0917-8
- Om, C., Daily, F., Vlieghe, E., McLaughlin, J. C., and McLaws, M. L. (2017). Pervasive antibiotic misuse in the Cambodian community: Antibiotic-seeking behavior with unrestricted access. *Antimicrobial Resistance Infection Control* 6, 30. doi: 10.1186/s13756-017-0187-y
- Özcebe, H., Üner, S., Karadag, O., Daryani, A., Gershuni, O., Czabanowska, K., et al. (2022). Perspectives of physicians and pharmacists on rational use of antibiotics in Turkey and among Turkish migrants in Germany, Sweden and the Netherlands: A qualitative study. *BMC Primary Care* 23, 29. doi: 10.1186/s12875-022-01636-8
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Rev.* 10, 89. doi: 10.1186/s13643-021-01626-4
- Peiffer-Smadja, N., Allison, R., Jones, L. F., Holmes, A., Patel, P., Lecky, D. M., et al. (2020). Preventing and managing urinary tract infections: Enhancing the role of community pharmacists - a mixed methods study. *Antibiotics* 9, 583. doi: 10.3390/antibiotics9090583
- Pokharel, S., Adhikari, B., Johnson, T., and Cheah, P. Y. (2024). Interventions to address antimicrobial resistance: An ethical analysis of key tensions and how they apply in low-income and middle-income countries. *BMJ Global Health* 9, e012874. doi: 10.1136/bmjgh-2023-012874
- Poss-Doering, R., Kamradt, M., Stuermlinger, A., Glassen, K., Kaufmann-Kolle, P., Andres, E., et al. (2020). The complex phenomenon of dysrational antibiotics prescribing decisions in German primary healthcare: A qualitative interview study using dual process theory. *Antimicrobial Resistance Infection Control* 9, 6. doi: 10.1186/s13756-019-0664-6
- Pouwels, K. B., Hopkins, S., Llewellyn, M. J., Walker, A. S., McNulty, C. A., and Robotham, J. V. (2019). Duration of antibiotic treatment for common infections in English primary care: cross sectional analysis and comparison with guidelines. *BMJ* 364, 1440. doi: 10.1136/bmj.1440
- Pristanty, L., Kurniati, V. L., and Hidayati, I. R. (2019). Knowledge and attitude: Two fundamental factors that determine patient compliance in antibiotic therapy. *J. Basic Clin. Physiol. Pharmacol.* 30, N.PAG. doi: 10.1515/jbcpp-2019-0321
- RaChina, S., Zakharenkova, P., Kozlov, R., Palagin, I., Shishkina, K., Strelkova, D., et al. (2024). The antibiotic knowledge, attitudes and behaviors of patients purchasing antibiotics with prescription in Russia: A qualitative, comparative analysis. *JAC-Antimicrobial Resistance* 6, dlac041. doi: 10.1093/jacamr/dlae041
- Rao, I., Shaham, A., Yavneh, A., Kahana, D., Ashlagi, I., Brandeau, M. L., et al. (2020). Predicting and improving patient-level antibiotic adherence. *Health Care Manage. Sci.* 23, 507–519. doi: 10.1007/s10729-020-09523-3
- Raspopovic, K., Jankovic, S., and Opancina, V. (2016). Factors affecting inappropriate prescription of antibiotics and the emergence of antibiotic resistance in patients in primary health care. *Medicinski Casopis* 50, 85–90. doi: 10.5937/mckg50-12699
- Reeves, S., Pelone, F., Harrison, R., Goldman, J., and Zwarenstein, M. (2017). Interprofessional collaboration to improve professional practice and healthcare outcomes. *Cochrane Database Systematic Rev.* 6, CD000072. doi: 10.1002/14651858.CD000072.pub3
- Res, R., Hoti, K., and Charrois, T. L. (2017). Pharmacists' perceptions regarding optimization of antibiotic prescribing in the community. *J. Pharm. Pract.* 30, 146–153. doi: 10.1177/0897190015623883
- Ridd, M., Shaw, A., Lewis, G., and Salisbury, C. (2009). The patient-doctor relationship: A synthesis of the qualitative literature on patients' perspectives. *Br. J. Gen. Pract.* 59, e116–e133. doi: 10.3399/bjgp09X420248
- Ryves, R., Eyles, C., Moore, M., McDermott, L., Little, P., and Leydon, G. M. (2016). Understanding prescribing of antibiotics for respiratory tract infection in primary care: A qualitative analysis. *BMJ Open* 6, pe011882. doi: 10.1136/bmjopen-2016-011882
- Saleem, Z., Hassali, M. A., Hashmi, F. K., Godman, B., and Saleem, F. (2019). Antimicrobial dispensing practices and determinants of antimicrobial resistance: A qualitative study among community pharmacists in Pakistan. *Family Med. Community Health* 7, e000138. doi: 10.1136/fmch-2019-000138
- Saleh, D., Abu-Farha, R., Mukattash, T. L., Barakat, M., and Alefishat, E. (2021). Views of community pharmacists on antimicrobial resistance and antimicrobial stewardship in Jordan: A qualitative study. *Antibiotics* 10, p.384. doi: 10.3390/antibiotics10040384
- Saliba-Gustafsson, E. A., Nyberg, A., Borg, M. A., Rosales-Klinton, S., and Stålsby Lundborg, C. (2021). Barriers and facilitators to prudent antibiotic prescribing for acute respiratory tract infections: A qualitative study with general practitioners in Malta. *PLoS One* 16, pe0246782. doi: 10.1371/journal.pone.0246782
- Saliba-Gustafsson, E. A., Röing, M., Borg, M. A., Rosales-Klinton, S., and Lundborg, C. S. (2019). General practitioners' perceptions of delayed antibiotic prescription for respiratory tract infections: A phenomenographic study. *PLoS One* 14, e0225506. doi: 10.1371/journal.pone.0225506
- Salim, A. M., and Elgizoli, B. (2017). Exploring the reasons why pharmacists dispense antibiotics without prescriptions in Khartoum state, Sudan. *Int. J. Pharm. Pract.* 25, 59–65. doi: 10.1111/ijpp.12317
- Santana, M. J., Manalili, K., Jolley, R. J., Zelinsky, S., Quan, H., and Lu, M. (2018). How to practice person centered care: A conceptual framework. *Health Expectations* 21, 429–440. doi: 10.1111/hex.12640
- Sargent, L., McCullough, A., Del Mar, C., and Lowe, J. (2017). Using theory to explore facilitators and barriers to delayed prescribing in Australia: A qualitative study using the Theoretical Domains Framework and the Behavior Change Wheel. *BMC Family Pract.* 18, 20. doi: 10.1186/s12875-017-0589-1
- Sayood, S. J., Botros, M., Suda, K. J., Foraker, R., and Durkin, M. J. (2021). Attitudes toward using clinical decision support in community pharmacies to promote antibiotic stewardship. *J. Am. Pharm. Assoc.* 61, 565–571. doi: 10.1016/j.japh.2021.04.008
- Schiavo, J. H. (2019). PROSPERO: An international register of systematic review protocols. *Med. Reference Serv. Q.* 38, 171–180. doi: 10.1080/02763869.2019.1588072
- Schmiege, D., Evers, M., Kistemann, T., and Falkenberg, T. (2020). What drives antibiotic use in the community? A systematic review of determinants in the human outpatient sector. *Int. J. Hygiene Environ. Health* 226, 113497. doi: 10.1016/j.ijheh.2020.113497
- Sharaf, N., Al-Jayyousi, G. F., Radwan, E., Shams Eldin, S. M. E., Hamdani, D., Al-Katheeri, H., et al. (2021). Barriers of appropriate antibiotic prescription at PHCC in Qatar: Perspective of physicians and pharmacists. *Antibiotics* 10, 317. doi: 10.3390/antibiotics10030317
- Shen, X., Jiang, H., Xu, H., et al. (2020). The global prevalence of turnover intention among general practitioners: A systematic review and meta-analysis. *BMC Family Pract.* 21, 246. doi: 10.1186/s12875-020-01309-4
- Sievert, E. D. C., Korn, L., Gross, M., Santana, A. P., Böhm, R., and Betsch, C. (2024). Communicating diagnostic uncertainty reduces expectations of receiving antibiotics: Two online experiments with hypothetical patients. *Appl. Psychol. Health Well-Being* 16, 1459–1478. doi: 10.1111/aphw.12536
- Sijbom, M., Büchner, F. L., Saadah, N. H., Numans, M. E., and de Boer, M. G. J. (2023). Determinants of inappropriate antibiotic prescription in primary care in developed countries with general practitioners as gatekeepers: A systematic review

- and construction of a framework. *BMJ Open* 13, e065006. doi: 10.1136/bmjopen-2022-065006
- Simeoni, M., Saragosa, M., Laur, C., Desveaux, L., Schwartz, K., and Ivers, N. (2022). Coping with 'the grey area' of antibiotic prescribing: A theory-informed qualitative study exploring family physician perspectives on antibiotic prescribing. *BMC Primary Care* 23, 188. doi: 10.1186/s12875-02201806-8
- Singh, S., Degeling, C., Fernandez, D., Montgomery, A., Caputi, P., and Deane, F. P. (2022). How do aged care staff feel about antimicrobial stewardship? A systematic review of staff attitudes in long-term residential aged-care. *Antimicrobial Resistance Infection Control* 11 92. doi: 10.1186/s13756-022-01128-5
- Sköld, M., Aabenhus, R., Guassora, A. D., and Mäkelä, M. (2017). Antibiotic treatment failure when consulting patients with respiratory tract infections in general practice: A qualitative study to explore Danish general practitioners' perspectives. *Eur. J. Gen. Pract.* 23, 120–127. doi: 10.1080/13814788.2017.1305105
- Souto-López, L., Vazquez-Cancela, O., Vazquez-Lago, J. M., López-Durán, A., and Figueiras, A. (2020). Parent-related factors influencing antibiotic use in a pediatric population: A qualitative study in Spain. *Acta Paediatrica* 109, 2719–2726. doi: 10.1111/apa.15277
- Spicer, J. O., Roberts, R. M., and Hicks, L. A. (2020). Perceptions of the benefits and risks of antibiotics among adult patients and parents with high antibiotic utilization. *Open Forum Infect. Dis.* 7, p. doi: 10.1093/ofid/ofaa544
- Spurling, G. K., Del Mar, C. B., Dooley, L., Foxlee, R., and Farley, R. (2017). Delayed antibiotic prescriptions for respiratory infections. *Cochrane Database Systematic Rev.* 2017, .CD004417. doi: 10.1002/14651858.CD004417
- Stewart, S. J. F., Moon, Z., and Home, R. (2022). Medication nonadherence: Health impact, prevalence, correlates and interventions. *Psychol. Health* 38, 726–765. doi: 10.1080/08870446.2022.2144923
- Stivers, T., and Timmermans, S. (2021). Arriving at no: Patient pressure to prescribe antibiotics and physicians' responses. *Soc. Sci. Med.* 290, 114007. doi: 10.1016/j.socscimed.2021.114007
- Sulis, G., Adam, P., Nafade, V., Gore, G., Daniels, B., Daftary, A., et al. (2020). Antibiotic prescription practices in primary care in low- and middle-income countries: A systematic review and meta-analysis. *PLoS Med.* 17, e1003139. doi: 10.1371/journal.pmed.1003139
- Sumner, S., Forsyth, S., Collette-Merrill, K., Taylor, C., Vento, T., Veillette, J., et al. (2018). Antibiotic stewardship: The role of clinical nurses and nurse educators. *Nurse Educ. Today* 60, 157–160. doi: 10.1016/j.nedt.2017.10.011
- Sundvall, P. D., Skoglund, I., Hess-Wargbaner, M., and Åhrén, C. (2020). Rational antibiotic prescribing in primary care: Qualitative study of opportunities and obstacles. *BJGP Open* 4, bjgpopen20X101079. doi: 10.3399/bjgpopen20X101079
- Suy, S., Rego, S., Bory, S., Chhorn, S., Phou, S., Prien, C., et al. (2019). Invisible medicine sellers and their use of antibiotics: A qualitative study in Cambodia. *BMJ Global Health* 4, e001787. doi: 10.1136/bmjgh-2019-001787
- Sychareun, V., Phounsavath, P., Sihavong, A., Kounnavong, S., Chaleunvong, K., Machowska, A., et al. (2022). Perceptions and reported practices of pregnant women and mothers of children under two years of age regarding antibiotic use and resistance in Vientiane province, Lao PDR: A qualitative study. *BMC Pregnancy Childbirth* 22, 569. doi: 10.1186/s12884022-04894-7
- Tark, A., Estrada, L. V., Tresgallo, M. E., Quigley, D. D., Stone, P. W., and Agarwal, M. (2020). Palliative care and infection management at end of life in nursing homes: A descriptive survey. *Palliative Med.* 34, 580–588. doi: 10.1177/0269216320902672
- Thaggard, S., Reid, S., Chan, A., White, C., Fraser, L., Arroll, B. A., et al. (2023). Whānau Māori and Pacific peoples' knowledge, perceptions, expectations and solutions regarding antibiotic treatment of upper respiratory tract infections: A qualitative study. *BMC Infect. Dis.* 23, 458. doi: 10.1186/s12879-023-08431-5
- Tonna, A. P., Weidmann, A. E., Sneddon, J., and Stewart, D. (2020). Views and experiences of community pharmacy team members on antimicrobial stewardship activities in Scotland: A qualitative study. *Int. J. Clin. Pharm.* 42, 1261–1269. doi: 10.1007/s11096-020-01042z
- Torres, N. F., Solomon, V. P., and Middleton, L. E. (2020). Pharmacists' practices for non-prescribed antibiotic dispensing in Mozambique. *Pharm. Pract. (Granada)* 18, 1965. doi: 10.18549/PharmPract.2020.3.1965
- Torres, N. F., Solomon, V. P., and Middleton, L. E. (2023). "Antibiotics heal all diseases"; the factors influencing the practices of self-medication with antibiotics in Maputo City, Mozambique. *J. Public Health (Berl.)* 31, 73–84. doi: 10.1007/s10389-020-01416-7
- van der Zande, M. M., Dembinsky, M., Aresi, G., and van Staa, T. P. (2019). General practitioners' accounts of negotiating antibiotic prescribing decisions with patients: A qualitative study on what influences antibiotic prescribing in low, medium and high prescribing practices. *BMC Family Pract.* 20, 172. doi: 10.1186/s12875-019-1065-x
- van Hecke, O., Butler, C., Mendelson, M., and Tonkin-Crine, S. (2019b). Introducing new point-of-care tests for common infections in publicly funded clinics in South Africa: A qualitative study with primary care clinicians. *BMJ Open* 9, e029260. doi: 10.1136/bmjopen-2019-029260
- van Hecke, O., Butler, C. C., Wang, K., and Tonkin-Crine, S. (2019a). Parents' perceptions of antibiotic use and antibiotic resistance (PAUSE): A qualitative interview study. *J. Antimicrobial Chemotherapy* 74, 1741–1747. doi: 10.1093/jac/dkz091
- van Horrik, T. M., Colliers, A., Blanker, M. H., de Bont, E. G., van Driel, A. A., Laan, B. J., et al. (2024). Qualitative study on shared decision making in cystitis management in general practice. *BJGP Open* 8 (3), BJGPO.2023.0179. doi: 10.3399/BJGPO.2023.0179
- Varkey, B. (2021). Principles of clinical ethics and their application to practice. *Med. principles Pract.* 30, 17–28. doi: 10.1159/000509119
- Velgan, M., Vanderheyde, T., Kalda, R., and Michels, N. (2023). Driving forces of GPs' migration in Europe: An exploratory qualitative study. *BJGP Open* 7, p. doi: 10.3399/BJGPO.2022.0132
- Wang, D., Liu, C., Zhang, X., and Liu, (2021). Does diagnostic uncertainty increase antibiotic prescribing in primary care? *NPJ Primary Care Respir. Med.* 31, 17. doi: 10.1038/s41533-02100229-9
- Williams, S. J., Halls, A. V., Tonkin-Crine, S., Moore, M. V., Latter, S. E., Little, P., et al. (2018). General practitioner and nurse prescriber experiences of prescribing antibiotics for respiratory tract infections in UK primary care out-of-hours services (the UNITE study). *J. Antimicrobial Chemotherapy* 73, 795–803. doi: 10.1093/jac/dkx429
- Wong, L. H., Tay, E., Heng, S. T., Guo, H., Kwa, A. L. H., Ng, T. M., et al. (2021). Hospital pharmacists and antimicrobial stewardship: A qualitative analysis. *Antibiotics* 10, 1441. doi: 10.3390/antibiotics10121441
- World Health Organization (2015). *Global action plan on antimicrobial resistance*. (Geneva: World Health Organization).
- World Health Organization (2017). *Antimicrobial Resistance. Fact sheets on sustainable development goals: Health targets* (Geneva: World Health Organization).
- World Health Organization (2018). *Antimicrobial resistance and primary health care*. (Geneva: World Health Organization).
- Yates, T. D., Davis, M. E., Taylor, Y. J., Davidson, L., Connor, C. D., Buehler, K., et al. (2018). Not a magic pill: A qualitative exploration of provider perspectives on antibiotic prescribing in the outpatient setting. *BMC Family Pract.* 19, 96. doi: 10.1186/s12875-018-0788-4
- Zago, L. F., Correa, J. S., da Silva, B. R. R., Fraccolli, L. A., Padoveze, M. C., de Oliveira, S. M., et al. (2023). Experiences of antibiotic use among Brazilian healthcare users: An exploratory study. *Health Expectations* 26, 343–354. doi: 10.1111/hex.13664
- Zaykova, K., Nikolova, S., Pancheva, R., and Serbezova, A. (2022). A survey of knowledge, attitudes and use of antibiotics among Bulgarian population. *Biotechnol. Equip.* 36, 933–941. doi: 10.1080/13102818.2022.2145237
- Zetts, R. M., Stoesz, A., Garcia, A. M., Doctor, J. N., Gerber, J. S., Linder, J. A., et al. (2020). Primary care physicians' attitudes and perceptions towards antibiotic resistance and outpatient antibiotic stewardship in the USA: A qualitative study. *BMJ Open* 10, e034983. doi: 10.1136/bmjopen2019-034983