

Barriers to the implementation of antimicrobial stewardship programmes in long-term care facilities: a scoping review

Costanza Vicentini ¹, Giulia Libero¹, Eleonora Cugudda ^{1*}, Paolo Gardois², Carla Maria Zotti¹
and Fabrizio Bert ¹

¹Department of Public Health Sciences and Pediatrics, University of Turin, Torino, Italy; ²Department of Public Health Sciences and Pediatrics, Medical Library 'Ferdinando Rossi', University of Turin, Torino, Italy

*Corresponding author. E-mail: eleonora.cugudda@unito.it

Background: Long-term care facilities (LTCFs) present specific challenges for the implementation of antimicrobial stewardship (AMS) programmes. A growing body of literature is dedicated to AMS in LTCFs.

Objectives: We aimed to summarize barriers to the implementation of full AMS programmes, i.e. a set of clinical practices, accompanied by recommended change strategies.

Methods: A scoping review was conducted through Ovid-MEDLINE, CINAHL, Embase and Cochrane Central. Studies addressing barriers to the implementation of full AMS programmes in LTCFs were included. Implementation barriers described in qualitative studies were identified and coded, and main themes were identified using a grounded theory approach.

Results: The electronic search revealed 3904 citations overall. Of these, 57 met the inclusion criteria. All selected studies were published after 2012, and the number of references per year progressively increased, reaching a peak in 2020. Thematic analysis of 13 qualitative studies identified three main themes: (A) LTCF organizational culture, comprising (A1) interprofessional tensions, (A2) education provided in silos, (A3) lack of motivation and (A4) resistance to change; (B) resources, comprising (B1) workload and staffing levels, (B2) diagnostics, (B3) information technology resources and (B4) funding; and (C) availability of and access to knowledge and skills, including (C1) surveillance data, (C2) infectious disease/AMS expertise and (C3) data analysis skills.

Conclusions: Addressing inappropriate antibiotic prescribing in LTCFs through AMS programmes is an area of growing interest. Hopefully, this review could be helpful for intervention developers and implementers who want to build on the most recent evidence from the literature.

Introduction

Improving the use of antibiotics in all healthcare settings to protect patients and nursing home residents and reduce the threat of antimicrobial resistance (AMR) is a recognized public health priority.¹ According to the most recent ECDC point prevalence survey, the prevalence of antimicrobial use in long-term care facilities (LTCFs) in Europe was 4.9% in 2016–2017.² Studies suggest an important proportion of these antibiotics may be unnecessary or inappropriate, posing an important risk for the residents receiving them and increasing the selective pressure for the emergence of AMR bacteria.³ Adverse drug events, *Clostridioides difficile* infections and infection with AMR organisms are especially concerning for residents of LTCFs,³ which are often elder and frail individuals with numerous comorbidities.

Infections with AMR organisms in LTCF residents are also associated with more severe infections, increased risk and length of hospitalization, increased risk of death and increased healthcare costs.^{1,4}

Antimicrobial stewardship (AMS) is defined as a set of commitments and actions aiming to optimize the treatment of infections while reducing the adverse events associated with antibiotic use. By improving antibiotic prescribing practices and reducing inappropriate use, AMS interventions have the potential of improving quality of care and increasing patient safety.⁴

Much focus has been placed on AMS in acute-care hospitals, although antimicrobial use in non-acute-care settings must also be addressed.⁵ When tackling AMR, the broader health system should be considered: LTCFs can act as reservoirs for AMR

organisms, and residents transferring to and from acute-care facilities can amplify their spread.⁶ Additionally, the treatment of LTCFs-acquired infections is a growing indication for antibiotic use in acute-care facilities, increasing overall antibiotic pressure.⁷

LTCF residents present specific challenges in aligning with best practice recommendations for antibiotic use, due to atypical symptoms of infection, patient characteristics such as cognitive impairment, immunosenescence, complex comorbidities and frequent hospitalizations. Further, the LTCF setting presents specific challenges to implementing quality improvement interventions, due to staffing and resource constraints, especially concerning diagnostic testing.⁸

We are aware of two previous reviews on this subject. The first was a narrative review by Crnich *et al.*, published in 2015,⁸ which identified patient-related factors, diagnostic difficulties, time constraints and staffing issues as the main barriers for the implementation of AMS programmes in LTCFs. The authors suggested a structured approach to improve implementation: assessing local patterns, determinants and outcomes of antimicrobial usage, developing educational interventions based on collected information and implementing targeted interventions focused on processes. However, the authors acknowledged that several issues, in particular fidelity and sustainability, remained to be addressed.

The second, a structured review by Morrill *et al.* published in 2016, summarized barriers to AMS in LTCFs from 14 studies.⁹ Morrill *et al.* found considerable barriers existed to the promotion of appropriate use of antimicrobials in LTCFs, with the potential of significantly affecting the implementation and success of AMS programmes. The main barriers identified by Morrill *et al.* were (i) a lack of well-validated, context-specific strategies, (ii) resource limitations, from diagnostic infrastructure to trained ID physicians and pharmacists, (iii) a lack of diagnostic criteria and treatment pathways and (iv) resident and family expectations. The most effective interventions identified in the review were multifaceted programmes employing multiple educational modalities.⁹

Since 2016, AMS in LTCFs has become an increasingly studied topic, with a growing body of literature describing the implementation of a variety of interventions. We aimed to build on and update the evidence of the reviews by Crnich *et al.* and Morrill *et al.*^{8,9} to identify barriers that might have arisen with the implementation of more developed AMS programmes in LTCFs. The objective of our review was to identify barriers to the implementation of full AMS programmes (i.e. a set of clinical practices, accompanied by recommended change strategies) in LTCFs. We focused on full AMS programmes as opposed to barriers to aligning with best practice recommendations, which were described in detail in the previously cited reviews and include barriers related to patient characteristics, diagnostic uncertainty, risk perception and family/care-giver pressure. We aimed to highlight elements to consider in the design and implementation of full AMS programmes in LTCFs, hopefully providing guidance for effective implementation to address ongoing challenges in this area.

Materials and methods

We conducted a scoping review in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist guidelines

([Supplementary data](#), available as [Supplementary data](#) at JAC Online). This method was chosen as it allows to summarize research findings from a diverse body of literature, pertaining to a broad topic.¹⁰

The research question was based on the Population, Interest, Context (PICO) framework¹¹:

- Population: adult residents of LTCFs, nursing homes (NHs) and similar long-term care institutions for the elderly.
- Phenomena of interest: barriers to the implementation of full AMS programmes, experienced by programme implementers (personnel involved in the programme at any level: from coordinators of the programme to staff required to change their clinical practice in compliance with the programme). We considered full AMS programmes interventions including one or more component [such as education, audit and feedback, information technology (IT) interventions] and change strategies, aiming to optimize antibiotic use in LTCFs.
- Context: LTCFs implementing full AMS programmes.

Information sources

An electronic literature search for research articles published up to March 2023 was performed, which was initially conducted on 22 July 2021 and updated on 14 March 2023. The search was restricted to papers written in English. Four databases were investigated: Ovid-MEDLINE, CINAHL, Embase and Cochrane Central. Search terms included both MeSH terms and free text (keywords, synonyms and word variations), connected with Boolean operators. Strings used for each database are available in the [Supplementary data](#). A co-author is a librarian with experience in search strategies, and was involved in building the strings and performed the search. Further, references of included articles were searched for potentially relevant records.

Eligibility criteria

Studies addressing barriers to the implementation of full AMS programmes in LTCFs published from the year 2000 and in English were included. Concerning study types, we included qualitative studies, surveys, randomized controlled trials (RCTs), quasi-experimental studies and systematic or structured reviews. Narrative reviews, editorials, commentaries, conference abstracts, unpublished articles or articles for which full texts were not available were excluded. AMS strategies were classified as full programmes based on the fulfilment of at least four out of seven criteria outlined by the CDC Core Elements of Antibiotic Stewardship for Nursing Homes.⁵

Study selection

The screening of search results was performed using the web-based, open access platform Colandr.¹² Screening followed a three-step process. After removing duplicates, two authors (E.C., G.L.) independently screened the titles and abstracts for potential relevance. Three authors (E.C., G.L., C.V.) assessed the eligibility of full texts according to the inclusion/exclusion criteria. Discrepancies were resolved by consensus and reasons for exclusion at the full-text screening phase were recorded.

Strategy for data analysis and synthesis

Our analysis had two components. First, we described the results of the scoping review. Included studies were divided into three categories on the basis of study design:

- Primary studies with qualitative focus: qualitative studies and surveys with open-ended questions focusing specifically on implementation barriers;
- Primary studies with quantitative focus: RCTs, quasi-experimental studies and surveys describing the implementation of AMS programmes;
- Secondary studies: systematic and structured reviews.

General study characteristics (namely authors, year of publication, country of study, study design, setting and participants, study aim) were extracted for all included studies. Three different data extraction tables were developed for the three identified categories, and relevant information pertaining to each category were extracted.

The second component mainly considered primary studies with qualitative focus. A thematic analysis was conducted, implementation barriers addressed in these studies were identified and coded using QDA Miner lite.¹³ Main themes were identified through a grounded theory approach. Finally, findings of primary studies with quantitative focus and secondary studies were compared to the main themes identified through thematic analysis.¹⁴

Results

Scoping review results

The electronic search yielded 3736 citations from databases and 168 citations from other sources. Before screening, 286 duplicate records were removed. Of 3618 remaining papers, 3379 were excluded following title and abstract screening because they did not meet the eligibility criteria. This left 239 studies that were potentially relevant and retrieved in full text: 182 were excluded and 57 met the inclusion criteria. The PRISMA flow chart is depicted in Figure 1.

All selected studies were published after 2012, and the number of references per year progressively increased, reaching a peak in 2020 (Figure 2). Out of the included studies, 13 were classified as primary studies with qualitative focus, all published before 2019, 38 as primary studies with quantitative focus and six as secondary studies.

Table 1 summarizes general characteristics of all included studies. Concerning study design, most studies classified as primary studies with qualitative focus were qualitative studies ($n=9$); other study designs in this category were: survey, modified Delphi panel and mixed-methods study. Most primary studies with quantitative focus were quasi-experimental designs ($n=15$) and surveys ($n=11$). Overall, 40 studies were conducted in North-America (mostly in the USA), seven studies in Europe, four in Australia and one in Japan. Most studies were conducted in multiple LTCFs ($n=41$). Concerning study objectives, 22 studies evaluated the impact of AMS programmes, of which 10 studies evaluated the impact of programmes focusing in particular on urinary tract infections (UTIs), 11 studies aimed to assess the current state of AMS programmes in LTCFs and eight studies aimed to evaluate staff attitudes and perceptions towards AMS programmes in LTCFs.

Table 2 summarizes characteristics of the 13 primary qualitative studies. Most studies employed semi-structured interviews ($n=10$). The number of participants ranged from 11 to 232. Most study participants were healthcare workers of LTCFs, however, two studies included residents of LTCFs and residents and their advocates, family councils and other stakeholders. A broad range of topics were examined, from attitudes and perceptions of stakeholders and their roles (leadership, personnel, residents), to various aspects of AMS implementation (prescribing workflow, barriers and facilitators, prioritization of components, sustainability).

The qualitative analysis included nine qualitative studies, two mixed-method studies, one survey and one modified Delphi panel study.

Among the nine qualitative studies, in 2019 Dowson *et al.*²⁹ explored perspectives of health professionals on antimicrobial use near the end of life in 20 LTCFs, finding that facilitating advance care planning, care coordination, care delivery and communicating with families and medical professionals provide important opportunities to lead appropriate AMS activities. The following year, a second qualitative study was undertaken by the same authors in the same LTCFs to better understand antimicrobial use near the end of life and potential useful AMS activities from the standpoint of health professionals. The authors concluded that AMS activities that reinforce evidence-based clinical decision making and address family confidence in resident wellbeing are required near the end of life in aged care homes.³⁰

Four qualitative studies published in 2021 were included, three of which took into consideration multiple LTCFs. Laur *et al.* evaluated the impact of an audit and feedback intervention on prescribing practices of LTCFs physicians, stating that appealing to the role that prescribers see themselves in offers an opportunity to encourage desired changes and promote physicians to become change drivers.⁴⁴ Ramly *et al.* analysed antibiotic prescribing workflows to identify strategies for improving antibiotic prescribing in LTCFs, such as structured information tools, nurse and prescriber education and organizational improvement.⁵⁷ Seshadri *et al.* described LTCF staff experiences and perceptions of the factors that affect the sustainability of an AMS programme, finding three critical areas: explicit support by LTCF leadership, external partnerships with professionals with AMS expertise and internal interprofessional collaborations, and consistent education and training for all staff.⁶⁰

Chan *et al.* identified facilitators, barriers and strategies in implementing a UTI-focused AMS intervention in a single LTCF, with the secondary objective of exploring pharmacists' potential roles. According to the Authors, an effective AMS intervention should incorporate strategies to improve access, knowledge, communication and collaboration in its design, having sufficient resources and addressing external factors to optimize its success and long-term sustainability.²⁵

Hall *et al.* conducted a qualitative study among multiple LTCFs examining perceptions, experiences and practices of staff regarding the 'on the ground' work associated with implementing and upholding AMS objectives. The authors concluded that the inability of organizational accounting systems of capturing hidden AMS workflows has consequences for future resourcing and organizational learning, leaving AMS gaps unaddressed.³⁷

As the only included study carried on in Europe, Bridey *et al.*'s qualitative study explored French nurses' perceptions on AMS among multiple LTCFs, focusing on current and future potential roles in AMS in NHs, as well as facilitators and barriers. The authors found that new roles could help to compensate for the limited presence of doctors in NHs and develop infectious diseases skills.²⁰

Carter *et al.* focused in describing experiences and perceptions of residents of a single LTCF regarding antibiotics, with the goal of better understanding the decision-making needs of residents regarding their antibiotic treatments. According to the authors, aiming to improve collaborative decision making should address the unmet information needs of residents regarding their antibiotic treatment plans.²²

As part of the included mixed-method studies, Carter *et al.* carried on a mixed-method pilot study on six LTCFs to investigate

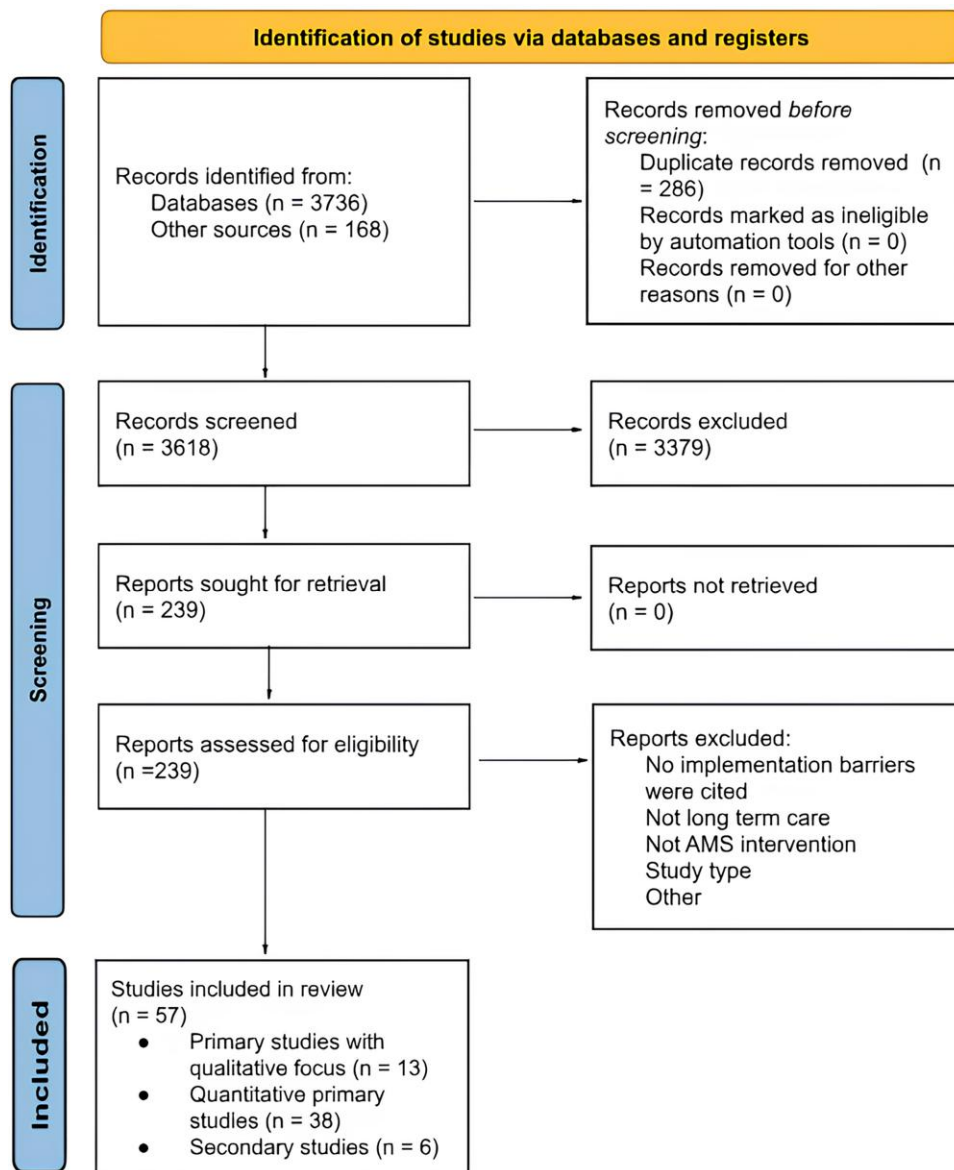


Figure 1. PRISMA flow chart. This figure appears in colour in the online version of JAC and in black and white in the print version of JAC.

antimicrobial use patterns and how that use corresponds with current leadership engagement in AMS practices, identifying supportive features of AMS: practice patterns grounded in established diagnostic criteria, proactive infection control and prevention, open communication and interconnectedness among staff.²¹

Chambers *et al.* investigated barriers and facilitators that contribute to antibiotic overuse for UTIs and found that the use of a stepped approach was valuable to ensure that locally relevant barriers and facilitators to practice change were addressed in the development of a programme to help minimize antibiotic prescribing for asymptomatic bacteriuria in the setting.²³

As the only open-ended survey included, Scales *et al.* explored perspectives on antibiotic use and AMS of nurses and medical providers in NHs, stating that AMS interventions should foster cooperation and build competency to implement

alternative management approaches and to educate residents and families.⁵⁹

Last, Kruger *et al.*'s modified Delphi panel was included, focusing on how to support nursing home providers with the selection and adoption of ASP interventions. Six key interventions were identified: guidelines for empiric prescribing, audit and feedback, communication tools, short-course antibiotic therapy, scheduled antibiotic reassessment and clinical decision support systems.⁴²

Details of the remaining studies included in the review are available in Tables S1 (primary studies with quantitative focus) and S2 (secondary studies). Concerning the 38 primary studies with quantitative focus, 26 described the implementation of an AMS programme. Of these studies, 20/26 described interventions with more than one component. The most frequent components of described AMS programmes were: education and training (16

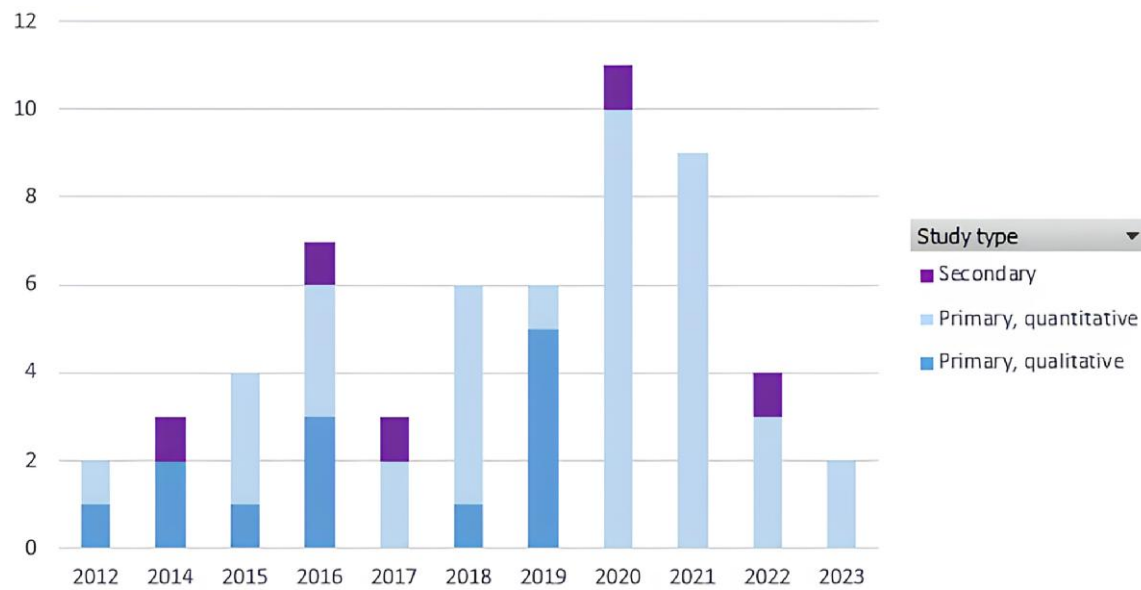


Figure 2. Number of records identified through the literature search and included in the review, per year of publication ($N=57$). This figure appears in colour in the online version of *JAC* and in black and white in the print version of *JAC*.

studies), guideline and decision-making tools (13), audit and feedback (nine). A wide range of outcomes were considered, from antibiotic use (both quantitative and qualitative), to infection rates, to clinical outcomes (hospitalization, mortality rates). Generally, improvements in considered outcomes were found, mostly considering outcomes pertaining to antibiotic use. The impact on infection rates or other clinical outcomes was less evident.

The remaining 12 primary studies with quantitative focus were surveys (Table 1 and Table S1). Eleven of these aimed to assess the current state of AMS practices in a region, and one aimed to assess institutional barriers to change before the implementation of an AMS intervention. Surveyed topics of interest included current AMS practices and organizational frameworks for the implementation of AMS programmes, attitudes towards AMS and opinions on strategies to promote AMS.

Finally, this review included six secondary studies. Of these, five aimed to review the literature on the impact of AMS programmes in LTCFs, three included an evaluation of barriers, implementation strategies or process evaluations, and one reviewed study on staff attitudes and perceptions towards AMS in LTCFs (Table 1). The number of included studies in each review ranged from 4 to 63 (Table S2). Three reviews included an evaluation of study quality, generally included studies were considered at moderate or high risk of bias.

Included studies demonstrated recurrently reduced antibiotic prescriptions following AMS interventions,^{28,34,38,45,58,66,70} often accompanied by non-significant differences in hospitalization and mortality rates.^{16,24,50,53} Notably, a common finding across studies was the decrease in positive tests for *C. difficile*,^{38,50,58} or at least a non-significant change.^{28,62} Another common result was a shortened duration of antibiotic therapy.^{27,40}

Thematic analysis

Thematic analysis identified three main themes: (A) LTCF organizational culture, comprising (A1) interprofessional tensions, (A2)

education provided in silos, (A3) lack of motivation and (A4) resistance to change; (B) resources, comprising (B1) workload and staffing levels, (B2) diagnostics, (B3) IT resources and (B4) funding and (C) availability of and access to knowledge and skills, including (C1) surveillance data, (C2) infectious disease/AMS expertise and (C3) data analysis skills. Table 3 summarizes sub-themes pertaining to each theme and provides examples from relevant articles.

Of the 38 primary studies with quantitative focus, 15 included a qualitative assessment that was not limited to a narrative description. Methods included: survey sections dedicated to AMS programme implementation ($N=5$), post-project interviews ($N=6$), structured process evaluation ($N=2$) and collaborative meetings ($N=1$). Results of these assessments were compared to the main themes identified through thematic analysis. Twelve studies addressed barriers to the implementation of AMS programmes pertaining to lack of knowledge and skills, 11 studies addressed LTCF organizational culture and nine studies cited lack of resources.

Concerning secondary studies, the review by Raban *et al.* included a qualitative description of findings of process evaluations of included studies, including levels of uptake and staff perceptions.⁵⁶ Singh *et al.* conducted a systematic review with the specific aim of investigating staff attitudes and perceptions towards AMS programmes in LTCFs.⁶¹

Discussion

Summary of the main findings

This scoping review summarized barriers to the implementation of full AMS programmes in LTCFs from 57 studies, including 13 qualitative studies that underwent thematic analysis. Three main themes were identified, which were mirrored by findings

Table 1. General characteristics of included studies (N=57)

First author (year)	Category	Country of study	Study design	Setting	Study aim
Aliyu <i>et al.</i> (2022) ¹⁵	S	NA	Systematic review	NA	To assess AMS programmes in LTCFs and their effects.
Arnold <i>et al.</i> (2021) ¹⁶	PQT	Denmark	RCT	Multiple LTCFs (N=22)	To investigate the impact of an AMS intervention focusing on UTIs.
Baier <i>et al.</i> (2022) ¹⁷	PQT	USA	Mixed-methods study	Multiple LTCFs (N=21)	To assess the feasibility of an AMS intervention.
Belan <i>et al.</i> (2021) ¹⁸	PQT	France	Survey	Multiple LTCFs (N=75)	To describe AMS current practices and to investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Bradley (2015) ¹⁹	PQT	USA	Survey	Multiple LTCFs (N=12)	To outline strategies for identifying existing gaps in AMS programmes and presents strategies for instituting or enhancing AMS programmes in acute and LTCFs.
Bridey <i>et al.</i> (2023) ²⁰	PQL	France	Qualitative study	Multiple LTCFs (N=20)	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs, as well as facilitators and barriers.
Carter <i>et al.</i> (2017) ²¹	PQL	USA	Mixed-methods pilot study	Multiple LTCFs (N=6)	To investigate antimicrobial use patterns in community LTCFs and how it corresponds with current LTCF leadership engagement in AMS practices.
Carter <i>et al.</i> (2023) ²²	PQL	USA	Qualitative study	Single LTCF	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Chambers <i>et al.</i> (2019) ²³	PQL	Canada	Mixed-methods study	Multiple LTCFs	To understand barriers and facilitators that contribute to antibiotic overuse for UTIs in LTCFs.
Chambers <i>et al.</i> (2021) ²⁴	PQT	Canada	Quasi-experimental study	Multiple LTCFs (N=45)	To investigate the impact of an AMS intervention focusing on UTIs.
Chan <i>et al.</i> (2021) ²⁵	PQL	Canada	Qualitative study	Single LTCF	To identify facilitators, barriers and strategies in implementing a UTI-focused AMS intervention at a LTCF.
Cooper <i>et al.</i> (2018) ²⁶	PQT	USA	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention focusing on UTIs.
Daneman <i>et al.</i> (2021) ²⁷	PQT	Canada	Difference-in-difference with embedded RCT	Multiple LTCFs	To investigate the impact of an AMS intervention.
Doernberg <i>et al.</i> (2015) ²⁸	PQT	USA	Quasi-experimental study	Multiple LTCFs (N=3)	To investigate the impact of an AMS intervention focusing on UTIs.
Dowson <i>et al.</i> (2019) ²⁹	PQL	Australia	Qualitative study	Multiple LTCFs (N=20)	To investigate the potential opportunities for nurses to undertake AMS activities near the end of life in LTCFs.
Dowson <i>et al.</i> (2020) ³⁰	PQL	Australia	Qualitative study	Multiple LTCFs (N=20)	To investigate staff attitudes and perceptions towards AMS programmes near the end of life.
Fornaro <i>et al.</i> (2020) ³¹	PQT	USA	Survey	Multiple LTCFs (N=87)	To assess the current state of AMS in LTCFs, to identify implementation barriers in particular concerning UTI management.
Fu <i>et al.</i> (2020) ³²	PQT	USA	Survey	Multiple LTCFs (N=861)	To assess the current state of AMS in LTCFs.
Furuno <i>et al.</i> (2014) ³³	PQT	USA	Quasi-experimental study	Multiple LTCFs (N=3)	To investigate the impact of an AMS intervention.
Gilbert <i>et al.</i> (2021) ³⁴	PQT	USA	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention focusing on UTIs.
Goebel <i>et al.</i> (2020) ³⁵	PQT	USA	Survey	Multiple LTCFs (N=4)	To assess institutional barriers to change before the implementation of an AMS intervention for ASB.

Continued

Table 1. Continued

First author (year)	Category	Country of study	Study design	Setting	Study aim
Gugkaeva and Franson (2012) ³⁶	PQT	USA	Quasi-experimental study	Single LTCF	To investigate the role of pharmacists for AMS in LTCF.
Hall <i>et al.</i> (2022) ³⁷	PQL	Australia	Qualitative study	Multiple LTCFs (N=8)	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Jump <i>et al.</i> (2012) ³⁸	S	USA	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention.
Jump <i>et al.</i> (2017) ³⁹	PQT	USA	Policy/guideline	NA	To share an AMS policy template tailored to the LTC setting, together with considerations for implementation.
Kassett <i>et al.</i> (2016) ⁴⁰	PQT	Canada	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention focusing on UTIs.
Kidd <i>et al.</i> (2016) ⁴¹	PQT	Belgium	Survey	Multiple LTCFs (N=39) ^a	To assess the current state of AMS in LTCFs.
Kruger <i>et al.</i> (2020) ⁴²	PQL	Canada	Modified Delphi panel	NA	To support LTCF providers with the selection and adoption of AMS interventions.
Kullar <i>et al.</i> (2018) ⁴³	PQT	USA	Case study, implementation roadmap	Multiple LTCFs	To provide a roadmap on how to implement AMS programmes in LTCFs.
Laur <i>et al.</i> (2021) ⁴⁴	PQL	Canada	Qualitative study	Multiple LTCFs	To investigate the impact of an AMS intervention.
Lee <i>et al.</i> (2018) ⁴⁵	PQT	Canada	Quasi-experimental study	Multiple LTCFs (N=7)	To investigate the impact of an AMS intervention focusing on UTIs.
M'ikanatha <i>et al.</i> (2019) ⁴⁶	PQT	USA	Survey	Multiple LTCFs (N=244)	To assess the current state of AMS in LTCFs.
Malani <i>et al.</i> (2016) ⁴⁷	PQT	USA	Survey	Multiple LTCFs (N=86)	To assess the current state of AMS in LTCFs.
McMaughan <i>et al.</i> (2016) ⁴⁸	PQT	USA	Quasi-experimental study	Multiple LTCFs (N=12)	To investigate the impact of an AMS intervention focusing on UTIs.
Morrill <i>et al.</i> (2016) ⁴⁹	S	NA	Structured review	NA	To identify (i) the need for AMS in LTCFs, (ii) barriers to AMS in LTCFs and (iii) previous studies related to implementation of AMS interventions in LTCFs.
Morrill <i>et al.</i> (2016) ⁹	PQT	USA	Survey	Multiple LTCFs (N=87)	To assess the current state of AMS in LTCFs.
Nace <i>et al.</i> (2020) ⁵⁰	PQT	USA	Randomized controlled quality improvement intervention	Multiple LTCFs (N=25)	To investigate the impact of an AMS intervention focusing on UTIs.
Nicolle (2014) ⁵¹	S	NA	Structured review	NA	To review current evidence evaluating the effectiveness of AMS interventions in LTCFs, to summarize potential effective approaches and to identify issues.
Palms <i>et al.</i> (2019) ⁵²	PQT	USA	Survey	Multiple LTCFs (N=2982)	To assess the current state of AMS in LTCFs.
Pasay <i>et al.</i> (2019) ⁵³	PQT	Canada	RCT	Multiple LTCFs (N=42)	To investigate the impact of an AMS intervention focusing on UTIs.
Pluss-Suard <i>et al.</i> (2020) ⁵⁴	PQT	Switzerland	Quasi-experimental study	Multiple LTCFs (N=23)	To investigate the impact of an AMS intervention.
Quilliam <i>et al.</i> (2018) ⁵⁵	PQT	USA	Survey, narrative description	Multiple LTCFs (N=88)	To assess the current state of AMS in LTCFs.
Raban <i>et al.</i> (2020) ⁵⁶	S	NA	Systematic review	NA	To review the effectiveness of interventions designed to reduce antibiotic use and/or inappropriate use in LTCFs; to provide a qualitative review of the results from process evaluations that were conducted as part of the intervention studies.
Ramly <i>et al.</i> (2021) ⁵⁷	PQL	USA	Qualitative study	Multiple LTCFs (N=6)	To analyse antibiotic prescribing workflows.

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Table 1. *Continued*

First author (year)	Category	Country of study	Study design	Setting	Study aim
Rhame <i>et al.</i> (2016) ⁵⁸	PQT	USA	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention.
Scales <i>et al.</i> (2017) ⁵⁹	PQL	USA	Survey	Multiple LTCFs (N = 31)	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Seshadri <i>et al.</i> (2021) ⁶⁰	PQL	USA	Qualitative study	Multiple LTCFs (N = 9)	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Singh <i>et al.</i> (2022) ⁶¹	S	NA	Systematic review	NA	To investigate staff attitudes and perceptions towards AMS programmes in LTCFs.
Sloane <i>et al.</i> (2020) ⁶²	PQT	USA	Pragmatic trial	Multiple LTCFs (N = 27)	To investigate the impact of an AMS intervention.
Stone <i>et al.</i> (2018) ⁶³	PQT	USA	Survey	Multiple LTCFs (N = 990)	To assess the current state of AMS in LTCFs.
Strazzulla <i>et al.</i> (2020) ⁶⁴	PQT	France	Quasi-experimental study	Multiple LTCFs (N = 3)	To investigate the impact of an AMS intervention.
Stuart <i>et al.</i> (2015) ⁶⁵	PQT	Australia	Quasi-experimental pilot study	Multiple LTCFs (N = 2)	To assess the role of the infection control clinical nurse consultant in the AMS team in LTCFs.
Takito <i>et al.</i> (2020) ⁶⁶	PQT	Japan	Quasi-experimental study	Single LTCF	To investigate the impact of an AMS intervention.
Tandan <i>et al.</i> (2019) ⁶⁷	PQT	USA	Quasi-experimental study	Multiple LTCFs (N = 27)	To investigate the impact of an AMS intervention.
Trautner <i>et al.</i> (2018) ⁶⁸	PQT	USA	Protocol for a controlled intervention study	Multiple LTCFs (N = 8)	To describe a study protocol aiming to reduce inappropriate use of antimicrobials for ASB.
Van Buul <i>et al.</i> (2015) ⁶⁹	PQT	Netherlands	Mixed-methods, quasi-experimental study	Multiple LTCFs (N = 10)	To investigate the impact of an AMS intervention.
Zimmerman <i>et al.</i> (2014) ⁷⁰	PQT	USA	Quasi-experimental study	Multiple LTCFs (N = 12)	To investigate the impact of an AMS intervention.

ASB, asymptomatic bacteriuria; PQL, primary, qualitative; PQT, primary, qualitative; S, secondary.

^aAssuming one medical coordinator per LTCF.

of the exploratory analysis of primary studies with quantitative focus and secondary studies.

Concerning the first theme, i.e. LTCF organizational culture, interprofessional tensions and communication barriers were frequently cited.^{22,23,25,29,30,37,57,60} LTCF organizational culture is characterized by the knowledge, beliefs and attitudes of medical providers, nursing staff, residents and families, which influence prescribing practices.⁵⁹ A critical issue was the role of nurses in AMS interventions, and the rigid interprofessional boundaries within LTCFs. One study found nurses perceived they were tasked with promoting AMS and assigned with related roles and responsibilities without having been provided with sufficient authority, with the implementation of AMS programmes in LTCFs often relying on the most untrained and least well-paid personnel.³⁷ Another study also highlighted the issue of low nurse empowerment, in particular in regards to prescriber openness to their professional opinion. Prescribers may have some reservations regarding nurses' ability to assess and report relevant patient information accurately, and in their ability to effectively implement alternative approaches for infection management.^{57,59} One the other hand, nurses expressed their resentment towards their

professional expertise being questioned by prescribers, and their reluctance to report patient changes to clinicians whom they feel will most likely initiate antibiotics, disregarding other options, as well as their unwillingness to challenge prescribers' opinions.^{22,37} The issue of interprofessional barriers and difficulties in communication translates to AMS education and training provided in LTCFs: one study found educational initiatives were provided in silos, with parallel training provided to nursing and medical staff, at different levels and without coordination.⁶⁰

Lack of motivation and resistance to change were also highlighted. One study found that physicians may resist interventions that they perceive as curtailing their professional autonomy and personalized care,⁵⁹ and another that nurses were aware of AMS but felt ambivalent about their role and did not consider it a priority.³⁷ The lack of motivation of temporary staff in particular was highlighted.⁶⁰ The same study also reported champions were highly committed, but felt they were facing an enormous task alone and experienced difficulties in maintaining cohesion within their team.⁶⁰

As expected, lack of resources was another important theme, from lack of staff, time, high staff turnover, lack of access to

Table 2. Characteristics of included studies classified as primary studies with qualitative focus (N=13)

First author, year	Examined topic	Data collection methods	Profession of participants	N of participants	Analysis/underlying theory
Bridey <i>et al.</i> (2023) ²⁰	Nurse's perceptions and roles in AMS	Semi-structured interview, focus groups	LTCF nurses and advanced practice registered nurses	27	Thematic analysis, inductive method
Carter <i>et al.</i> (2017) ²¹	Views and level of engagement of LTCF leadership concerning AMS	Semi-structured interview	Healthcare workers in leadership positions	11	Thematic analysis
Carter <i>et al.</i> (2023) ²²	Experiences and perceptions of LTCF residents regarding antibiotics	Semi-structured interview	LTCF residents	26	Conventional content analysis
Chambers <i>et al.</i> (2019) ²³	Barriers and facilitators to aligning with best practices regarding UTI assessment and management	Questionnaire with open-ended questions, stakeholder consultation	Healthcare workers in multiple positions	73	Theoretical domains framework
Chan <i>et al.</i> (2021) ²⁵	Facilitators, barriers and strategies in implementing a UTI-focused AMS intervention in an LTCF; pharmacist's role	Semi-structured interview	Healthcare workers in multiple positions	16	Conventional content analysis, mapping using COM-B model
Dowson <i>et al.</i> (2020) ²⁹	AMS at end of life	Semi-structured interview	Healthcare workers in multiple positions	20	Inductive/deductive coding, mapping to the theoretical domains framework/COM-B model
Dowson <i>et al.</i> (2020) ³⁰	AMS at end of life	Semi-structured interview	Healthcare workers in multiple positions	20	Inductive/deductive coding, mapping to the theoretical domains framework/COM-B model
Hall <i>et al.</i> (2022) ³⁷	Nurse's perceptions and roles in AMS	Semi-structured interview	Managers, nurses and senior and junior personal care assistants	56	Thematic analysis, inductive synthesis and a deductive contrast and comparison
Kruger <i>et al.</i> (2020) ⁴²	Selection and adoption of AMS interventions	Multiphase modified Delphi method: surveys supplemented with a 1-day consensus meeting	Physicians, infection control personnel, nurses, pharmacists, nursing home administration, nursing home residents and their advocates, family councils and other stakeholders	16	5 criteria were used to evaluate AMS interventions: (i) scientific merit, (ii) impact, (iii) feasibility, (iv) accountability, and (v) overall importance of the intervention; ranking according to priority
Laur <i>et al.</i> (2021) ⁴⁴	Prescribing audit and feedback AMS, intervention	Semi-structured interview	Physicians	18	Inductive/deductive coding, mapping to the theoretical domains framework
Ramly <i>et al.</i> (2021) ⁵⁷	Prescribing workflow	Interviews, observations and artefacts	Healthcare workers in multiple positions	68	Work systems model from human factors, Shannon-Weaver model of communication
Scales <i>et al.</i> (2017) ⁵⁹	Physician's and nurse's perspectives on AMS and influences on antibiotic prescribing	Self-administered questionnaire with open-ended questions	Healthcare workers in multiple positions	232	Narrative description
Seshadri <i>et al.</i> (2021) ⁶⁰	Sustainability of AMS programmes	Semi-structured interview	Healthcare workers in multiple positions	48	Integrated sustainability framework

Table 3. Main themes and subthemes identified through thematic analysis, and examples from relevant articles

Theme	Subtheme	Example	Reference
LTCF organizational culture	Interprofessional tensions	'... we were taught, as the clinician, to discuss it more with the GPs. So not quite —well, question them really as to whether it's necessary to have antibiotics ... They're the GPs ... They're in charge of those residents and I didn't feel it fitting for registered nurses to have to actually go, do you think that's the right process? Is that the right type of care? Should we be giving this antibiotic? I found that a little bit hard, even though we are autonomous in our practice, particularly in aged care ...—some doctors would tell you bugger off if you try and question what they're doing.' (Nurse)	Hall <i>et al.</i> ³⁷
	Communication barriers		
	Role of nurses		
	Education provided in silos		'The medical department I think does their own [AMS] education... but we have not been involved in their education.' The provider at the same facility said, 'I'm not sure what's done in orientation... the nursing orientation, I am from medical; we do it, you know, on a case-by-case basis.' At one nursing home, both the champion and the nurse educator created antibiotic stewardship education modules for staff in parallel and did not know what or when the other provided antibiotic stewardship education.'
Resources	Lack of motivation, AMS not considered a priority	'Other nurses and managers were aware of AMS but given the range of issues faced by residents and within the [LTCF], did not perceive it to be a clear priority. Of these, many did not believe antibiotics to be overprescribed pointing to their experiences of a historical shift in prescribing patterns in [LTCF] settings.'	Hall <i>et al.</i> ³⁷
	Resistance to change	'I want to ensure that we continue to treat the individual and not become too focused on following a list of criteria.' (Medical provider)	Scales <i>et al.</i> ⁵⁹
	Workload and staffing levels	'I'm literally on call from eight nursing homes over a weekend, so it's sometimes physically impossible to go see all the patients I'm being called about; so those physically not always seeing the patient and as well having physicians not familiar with the patients, those lead to I think sometimes inappropriate prescribing.'	Laur <i>et al.</i> ⁴⁴
	Lack of personnel		
	Lack of time		
	Diagnostics	'Without the assurance provided by the empirical use of antibiotics, nurses discussed how they had to navigate issues associated with the lack of on-site availability and reliability of diagnostic tests such as urinalysis ... and chest X-rays.'	Hall <i>et al.</i> ³⁷
	Lack of access to diagnostic equipment		
Delay in receiving test results	'participants felt that the antibiotic stewardship was "data driven", and that the lack of an in-house electronic health record (EHR) system limited their access to data. Gathering hand-written information from medical charts was time-consuming and labour intensive'	Seshadri <i>et al.</i> ⁶⁰	
Lack of IT resources			
Knowledge and skills	Funding	'And it's all about reducing expenses and you're not-for-profit. You can't stay afloat. They keep cutting and cutting and cutting money... and decreasing reimbursement.' (Director of Nursing)	Seshadri <i>et al.</i> ⁶⁰
	Lack of local surveillance data (healthcare associated infections and AMR rates)	'I'm not happy going and making my rounds in this facility that has all these germs running around and they don't seem to be trying to track it or see who's developing it or trying to contain it in any way.'	Carter <i>et al.</i> ²¹
	Lack of ID/AMS expertise	'[Hospital-based team AMS consultant] was very helpful because they understand that while you can have these cookie-cutter criteria and everything but still, you're dealing with people and humans and variability of provider comfort.' (Nurse Practitioner)	Seshadri <i>et al.</i> ⁶⁰
	Lack of data analysis skills	'...once data were collected, the [AMS programme] champion's level of comfort with data analyses varied.' One participant stated: 'Nobody is doing a thing with it. They have no clue what to do with the information.'	Seshadri <i>et al.</i> ⁶⁰

ID, infectious diseases; IT, information technology.

diagnostics and appropriate IT resources, to lack of funding to guarantee the sustainability of AMS programmes.^{21,24,25,29,30,37,57,59,60} An interesting point raised by one study was the issue of invisible

work performed by nursing staff, which affects their workload but goes unrecognized.³⁷ Residents also felt that, due to time constraints, staff did not take enough time to explain

prescribing decisions, hindering their ability to participate in shared decision making.²¹ Diagnostic uncertainty was a frequently cited barrier, with nurses facing important issues in navigating not only the lack of availability, but also of reliability of diagnostic tests in the LTCF setting.³⁷ On this note, a lack of training on appropriate sample collection practices was reported.²³ One study reported that workers felt there was a misalignment between professional activities, workflow and available IT tools for information sharing within the LTCF (e.g. paper-based walkarounds versus information sharing tools embedded in electronic health records).⁵⁷

The third theme we identified was availability of and access to knowledge and skills, not only limited to ID/AMS expertise, as limited data analysis skills were also identified.^{22,23,25,37,57,59} Owing to the lack of access to ID consultants and pharmacists, implementing back-end AMS strategies such as post-prescription review and adjusting antimicrobial therapy can prove challenging. Concerning the latter subtheme, one study highlighted the importance of having the competences to 'doing something' with the data that is collected.⁶⁰ Other studies reported that because data is not routinely collected, the extent to which practice is misaligned is unknown, hindering the establishment of benchmarks.^{23,30} It is difficult to conceive how an AMS programme can be sustainable without the guidance provided by changes in relevant process and outcome indicators.

Several strategies to promote the implementation of AMS programmes in LTCFs have been proposed. Lack of motivation could be addressed by incentivizing engagement through regulatory requirements, promoting leadership engagement,^{30,43,58-60,62,64} and identifying and training champions within the LTCF.^{21,23,25,28,30,31,41,48,62,64,68,70} The authors of one study included in the exploratory analysis suggested a facilitator of their intervention's success could be the increased engagement and buy-in facilitated by interactions between regional/state health department staff and LTCF personnel.²⁴ Another key to achieving high intervention adherence could be task-shifting, in particular enabling nurses to participate in the decision-making process and in the implementation of AMS programmes in a leadership capacity.²⁶ Important issues that should be addressed through further research include developing strategies to improve communication among staff and foster internal interprofessional collaborations, as well as reducing the hierarchical structure of the organization of work in LTCFs.^{21,23,25,36,42,53,60,65}

Education was found to be both an urgent need and the cornerstone to any intervention, and should be consistent and coordinated throughout the workforce, with further efforts dedicated to involving residents and family members.^{24,41} Interdisciplinary educational and training initiatives are particularly needed, which could be provided in collaboration with acute-care hospital AMS teams and regional health departments.⁴⁶ Beyond education, consultations provided by acute-care hospital AMS teams could also fill the gap in ID/AMS expertise, as was reported by a study included in this review that found the intervention had positive effects on both the acute-care institution and LTCF.⁵⁸

Tailoring AMS programmes to the local context is recognized as key for effective implementation; in their review, Raban *et al.* highlighted the importance of knowledge of the local culture

and context, including prescribing practices and specific issues, when building an AMS programme.⁵⁶ Another study included in the exploratory analysis underlined AMS programmes should be targeted to institutional needs and built keeping in mind resource availability.¹⁹ Finally, collecting surveillance data and applying standardized metrics are essential to guide improvement through feedback of local results, benchmarking and peer comparison.^{21,23,41,42,54,56,69,71}

Comparison with other reviews

Several findings of our review are consistent with results of a previous systematic review of reported experiences of LTC staff on the implementation of evidence-based guidelines into practice.⁷² Among the most frequently identified barriers were lack of resources, organizational issues (including lack of teamwork, lack of organizational support, inadequate staffing, time constraints) and knowledge gaps; whereas well-designed strategies and protocols, dedicated resources, leadership and champions and involving residents and family members, were frequently identified facilitators. According to the authors, consistent education and training initiatives, particularly if supported by organizations and standardized at the national level, could represent an effective knowledge translation strategy.⁷² According to results of our review, issues pertaining to LTCF work culture are particularly salient in the field of AMS programme implementation, mainly concerning interprofessional tensions and difficulties in communication as previously discussed.

Common themes were also identified considering reviews of AMS implementation not specific to the LTC setting. Bal and Gould categorized the main implementation barriers into strategic, operational and support issues. The authors concluded AMS requires engagement and action at multiple levels: from high-level government commitment, in the form of planning and strategy, to willingness to deliver at point of care, which could be facilitated through broader stakeholder buy-in.⁷³ In their review of AMS implementation in acute-care settings, which included mainly studies from developed countries, Rzewuska *et al.* found the most frequently reported barriers included lack of resources, personnel and technological infrastructure. Lack of prioritization was also a commonly reported issue.⁷⁴ Wu *et al.* conducted a review of barriers to implementing interventions aiming to improve appropriate antimicrobial use in low- and middle-income countries.⁷⁵ More than 80% of studies included in the review were set in secondary or tertiary hospitals, leading the authors to conclude further research is required to address inappropriate antibiotic use in the wider community in low- and middle-income countries. The most commonly reported barriers related to lack of resources and infrastructure limitations. Launching national policies, developing guidelines, contextualizing behaviour change interventions and engaging local stakeholders were identified as facilitators for successful implementation.⁷⁵ Interestingly, lack of resources appears to be an overarching issue, applying to acute and long-term settings, as well as to countries with different levels of income. In this review, the specific resources that would be required for the effective implementation of AMS programmes in LTCFs were described.

Limitations

This study had several limitations. First, our search algorithm may not have identified all studies reporting barriers and facilitators to the implementation of AMS programmes in LTCFs. Second, a scoping review approach was chosen to capture the diverse nature of studies in this area. In both the study selection and data extraction processes, we opted to be as inclusive as possible, which led to a broad range of study types to be included. Finally, it was not in the remit of this scoping review to assess the methodological quality of included studies, as our intent was to provide an overview of existing literature and not to synthesize evidence from different studies.¹⁰

Conclusions

Addressing inappropriate antibiotic prescribing in LTCFs through AMS programmes is an area of growing interest, and this review provided an updated summary and thematic analysis of implementation barriers. Hopefully, this review could be helpful for intervention developers and implementers wishing to build on the most recent evidence from the literature. Addressing inter-professional barriers, in particular staff hierarchy, lack of rapport and ineffective collaboration and communication, warrants further efforts.

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Transparency declarations

None to declare.

Supplementary data

Tables S1 and S2 are available as [Supplementary data](#) at JAC Online.

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