Drugs Aging (2015) 32:295–303
DOI 10.1007/s40266-015-0252-2

SYSTEMATIC REVIEW

Antibiotic Prescribing in Long-Term Care Facilities: A Meta-synthesis of Qualitative Research

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Published online: 2 April 2015

Abstract

Objectives The objective of this review was to synthesize the findings of qualitative studies investigating the factors influencing antibiotic prescribing in long-term care facilities (LTCFs). These findings will inform the development of future antimicrobial stewardship strategies (AMS) in this setting.

Methods We searched Embase, PubMed, PsycInfo, Social Science Citations Index and Google Scholar for all qualitative studies investigating health care professionals' views on antibiotic prescribing in LTCFs. The quality of the papers was assessed using the Critical Appraisal Skills Programme (CASP) assessment tool for qualitative research. Thematic synthesis was used to integrate the emergent themes into an overall analytical theme.

Results The synthesis of eight qualitative studies indicated that health care professionals and administrators have identified factors that influence antibiotic prescribing in LTCFs. These factors include variations in knowledge and practice among health care professionals, and the LTCF context, which is unique given the complex patient population and restricted access to doctors and diagnostic tests. The social factors underpinning the interaction between nurses, residents' families and doctors also influence decision making around antibiotic prescribing. The study also found that there is an acknowledged need for collaborative, evidence-based AMS specific to LTCFs, as antibiotic prescribing is heavily influenced by factors unique to this setting.

Conclusion This review highlighted the key contextual challenges for AMS in LTCFs. The findings provide an in-depth insight into the factors—such as the LTCF context, social factors, variability in knowledge and prescribing practices, and antimicrobial resistance—that impact on antibiotic prescribing and AMS strategies. These factors must be considered in order to ensure the feasibility and applicability of future AMS interventions.

Key Points

The influences of the long-term care facility (LTCF) context and social factors have an important impact on antibiotic prescribing in this setting.

According to the findings of this review, future antimicrobial stewardship strategies must emphasize the importance of knowledge of guidelines and antimicrobial resistance, and the strategies must be specifically designed for implementation in the LTCF setting.

1 Introduction

Recent studies evaluating the prescribing of antibiotics in long-term care facilities (LTCFs) have found that antibiotic prescribing is common, with reported annual prevalence rates ranging from 47 to 79 % [1]. As many as 25–75 % of

Electronic supplementary material The online version of this article (doi:10.1007/s40266-015-0252-2) contains supplementary material, which is available to authorized users.

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antibiotic prescriptions in LTCFs are inappropriate in terms of their indication, dose or duration of therapy [2]. Through reductions in antibiotic prescribing and encouragement of appropriate use of antibiotics, the rates of antimicrobial resistance (AMR) and adverse drug events can be reduced [3]. The few antimicrobial stewardship (AMS) intervention studies that have been conducted in LTCFs have reported modest effects, which were often not sustained [4, 5]. In order to establish how best to address AMS strategies in LTCFs, the factors that influence antibiotic prescribing behaviours must be determined and understood. There is a need for detailed awareness and understanding of the behaviour of all health care professionals involved in LTCF antibiotic prescribing.

There have been several qualitative review papers evaluating influences on antibiotic prescribing in primary and secondary care settings [6–8]. Qualitative studies investigating antibiotic prescribing in LTCFs have been conducted, but, to date, there has not been an overall synthesis of these studies. Synthesis of knowledge is important to bring together the findings of individual studies in order to further the understanding of a given issue [9]. A qualitative meta-synthesis integrates and compares findings across different studies, and the accumulated knowledge may lead to development of a new theory, narrative or interpretive translation [9, 10]. Synthesis of information from existing qualitative studies may help to contribute to AMS strategies in LTCFs.

The objective of this qualitative meta-synthesis was to synthesize the qualitative research findings that have collected health care professionals' and administrators' views of the factors influencing antibiotic prescribing in LTCFs.

2 Methods

2.1 Search Strategy

The following databases were searched from their inception until July 2014: Embase, PubMed, PsycInfo, Social Science Citations Index and Google Scholar. The search strategy that was adopted included the following search terms: (antibiotic* OR antibacterial* OR infection*) AND/OR (attitude of health personnel) AND (nursing home* OR long term care facilit*) AND (interview* OR 'qualitative research'). There were no date or language restrictions imposed. We searched the reference lists of relevant articles to screen for any relevant studies.

2.2 Study Inclusion Criteria

The studies were included in the review if they met the following criteria: (1) used qualitative data collection and analysis methods; (2) were focussed on LTCF antibiotic use; (3) included health care professionals (doctors, nurses or pharmacists, or a combination of these groups) or LTCF administrators in the sample; and (4) used qualitative methods to evaluate an AMS intervention. In the case of studies where qualitative and quantitative methods were employed, only the qualitative data were collected. The abstracts were evaluated by the primary author according to the inclusion criteria, and the full-text articles were obtained and evaluated where appropriate. Where there was uncertainty about whether to include a study in the review, another author was consulted.

2.3 Quality Appraisal

The quality of the papers was assessed using the Critical Appraisal Skills Programme (CASP) assessment tool for qualitative research, as outlined in Electronic Supplementary Material (ESM) Online Resource 1 [11]. Each author individually assessed the quality of each study, and a decision on the exclusion and inclusion of studies was made collectively and with consensus between all authors.

2.4 Analysis

Thematic synthesis was used to analyse the results of the studies included in this review. This method identifies the prominent or recurring themes in the literature and collates these findings under thematic headings [9, 12]. The initial stages conducted by two authors were line-by-line coding of the text and development of descriptive sub-themes as free codes without a hierarchy. The final stage was generation of main themes based on discussion between all authors. In order to present the synthesis of the findings, a conceptual model was developed by the primary author and reviewed by all authors. This qualitative synthesis is reported in accordance with the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) guidelines (see ESM Online Resource 2) [13].

3 Results

3.1 Study Selection Process

A total of 1308 papers were retrieved and reviewed according to the title. An abstract review of 139 studies was conducted, and 34 studies were selected for full-text review (Fig. 1). At this stage, 25 papers were excluded, leaving nine relevant studies, which were appraised for quality, using the CASP tool (see ESM Online Resources 1 and 3). One study was excluded on the basis of this assessment; therefore, eight studies were included in the analysis.

3.2 Study Characteristics

The details of the included studies are displayed in Table 1. All studies were conducted in LTCFs. Most studies included a mixed health care professional sample of nurses and doctors. One study included medical directors and administrators in the sample [14]. The most recently published study included nurses, doctors and pharmacists [15]. The focus of the studies was respiratory tract infection [RTI] ($n = 3$), urinary tract infection [UTI] ($n = 2$), asymptomatic bacteriuria ($n = 1$) or pneumonia ($n = 1$), and another study investigated antibiotic prescribing in LTCFs in general.

The studies that were included collected their data by interviews ($n = 3$) or focus group discussions ($n = 2$), and three studies used interviews and focus group discussions. Three studies were conducted to review the implementation of an infection management intervention: two reviewed an RTI care pathway and one reviewed a UTI care pathway, implemented during randomized controlled trials [14, 16, 17].

The quality appraisal of the studies found that all studies clearly stated their research aims and used qualitative methods appropriately (see ESM Online Resource 1). The research design was discussed in detail, and in all studies, the recruitment of participants was explained and justified. The method of data collection was presented in sufficient detail in all studies. One area where nearly all studies were lacking was that of researcher reflexivity. Two studies did not state whether they had obtained ethical approval or not

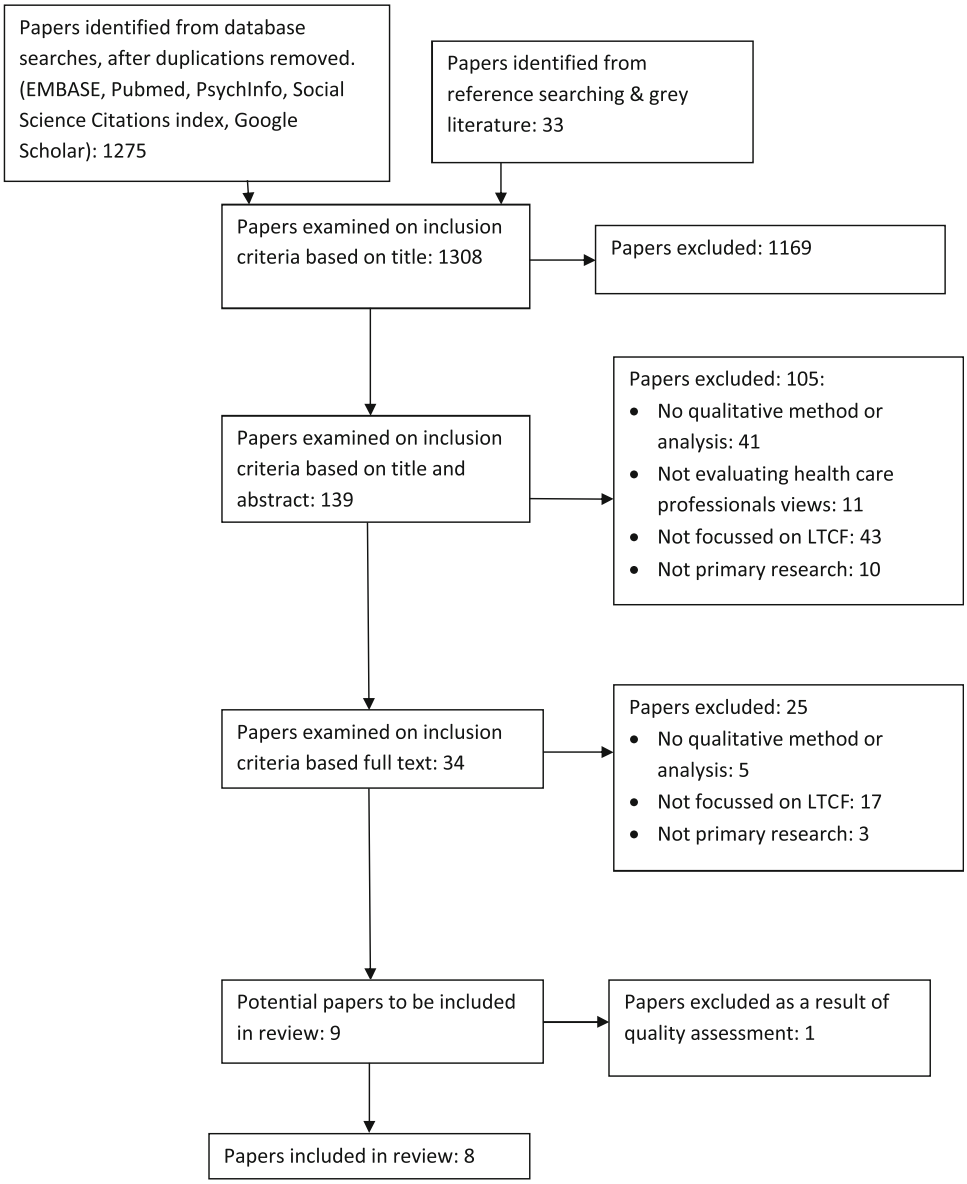

Fig. 1 Flow diagram outlining the identification of papers from searches. *LTCF* Long-term care facility

Table 1 Characteristics of the eight studies included in the synthesis

References	Geographical location	Participants	Data collection	Analysis	Aim
Carusone et al., part I [16]	Ontario, Canada	24 Nurses	7 Focus groups, 1 interview	Thematic analysis (template 5 phase)[a]	To determine nurses' perspectives on the utility and sustainability of an RTI pathway
Carusone et al., part II [14]	Ontario, Canada	6 Administrators, 2 medical directors	Interviews	Thematic analysis (template 5 phase)	To determine administrators' views of an RTI pathway and compare them with nurses' views (from Carusone et al., part I [16])
Helton et al. [21]	Netherlands; North Carolina, USA	Physicians (Netherlands: 12; North Carolina: 12)	Semi-structured interviews	Editing analysis[b]	To explore the factors influencing treatment decisions when nursing home patients with dementia become acutely ill with pneumonia
Lim et al. [15]	Victoria, Australia	40 Nurses, 15 GPs, 6 pharmacists	Focus groups, semi-structured interviews	Framework analysis	To explore perceptions and attitudes of key health care providers towards antibiotic prescribing
Lohfield et al. [17]	Ontario, Canada; Iowa, USA	52 Nurses, 19 administrators	19 Interviews, 10 focus groups	Editing style of analysis	To examine the views of nurses and administrators regarding a clinical pathway for managing UTIs
Russell and Gallen [22]	England	8 Nurses, 5 doctors	2 Focus groups	Thematic analysis	To determine the factors influencing antibiotic prescribing in nursing homes
Schweizer et al. [18]	Belfast, Northern Ireland	10 GPs, 10 nurses	Semi-structured interviews	Thematic analysis	To establish the decision making process for UTIs by qualitative means to identify steps in the process
Walker et al. [20]	Ontario, Canada	8 Nurses, 8 doctors	Focus group	Thematic analysis	To explore perceptions, attitudes and opinions of doctors and nurses about asymptomatic bacteriuria

GP general practitioner, *RTI* respiratory tract infection, *UTI* urinary tract infection

[a] Template analysis: the text is organized according to pre-existing theoretical or logical categories, to provide new descriptions of previously known phenomena [30]

[b] Editing analysis: units in the text are identified that form the basis for data-developed categories; these are used to reorganize the text so that the meaning can be clearly seen [30]

[17, 18]. One study was excluded on the basis of the quality assessment, as it was reported as a preliminary qualitative study, which had a small sample size and did not reach data saturation [19]. There was no loss of relevant findings on exclusion of that study. Themes and sub-themes that were derived from the thematic analysis, with supportive quotations from the studies, are presented in ESM Online Resource 4. A summary of the presence of the main themes within each included study is provided in ESM Online Resource 5.

3.3 Themes

3.3.1 The Long-Term Care Facility Context

The influence of the context of health care delivery in LTCFs was reported by nurses and doctors in most of the included studies. In two studies, it was noted that care of patients in the LTCF setting, rather than in the acute hospital setting, is better [14, 16]. This is linked to the relationship between the patient and the nurses and doctors. When the doctor, nurse or care assistant in the LTCF knows the patient for many years, it is likely that they will detect subtle changes in clinical signs and symptoms that could suggest infection [16, 20, 21]. Doctors providing on-call duty reported difficulty when managing patients that they did not know well, and they often prescribed an antibiotic to "cover themselves" [20]. There were many challenges reported by nurses and doctors in diagnosing patients with infection in LTCFs. The delay in obtaining microbiology results for urine samples was perceived as leading to increased empirical prescribing of antibiotics [15, 17, 18, 22]. Participants often depend on dipstick test results, interpreting a patient's change in behaviour or changes in the urine as a UTI [18, 20]. The difficulty in collecting urine samples from these patients was highlighted, as residents are often bed bound and incontinent [18]. Co-morbidities, such as cognitive impairment and incontinence, challenged the nurses' and doctors' ability to diagnose infection and conduct the necessary investigations. Not having a doctor on-site to assess patients as quickly as possible was also identified as a challenge to fast diagnosis and care [16–18, 22]. Prescribing of antibiotics without assessment by the doctor was referred to in several studies [17, 18]. The reasons that may have contributed to this included lack of time on the doctors' part to visit the LTCF and poor reimbursement for LTCF patient care, which resulted in reduced visits. Russell and Gallen [22] reported that many prescriptions were ordered over the telephone and that nurses were worried that antibiotic prescribing was conducted as a substitute for coming to see the patient.

3.3.2 Social Factors Influencing Prescribing

The central role of the LTCF nurse emerged as a very strong influence on antibiotic prescribing and infection management, as reported by nurses, doctors, administrators or pharmacists. It was evident that patient care in the LTCF is led by nurses, who are primarily responsible for detecting infection, assessing patients, taking microbiology samples where possible and communicating this information to the doctors [15, 20, 22]. Doctors reported that they depend on and trust the nurses' judgment in many cases [15, 20, 22]. In most studies, the doctors reported that nurse pressure can sometimes lead to increased use of antibiotics [15]. In general, however, they trust the nurses' judgment and recommendations. In two studies, doctors were sometimes critical of nurses in terms of the quality of communication and the accuracy of clinical information conveyed to them [20, 22]. The nurses in the study by Russell and Gallen [22] expressed frustration when doctors did not trust their knowledge or judgment. Poor communication between nurses and doctors was discussed by Carusone et al. [16] as having an impact on managing infection; distrust between doctors and nurses may lead to poor communication, which may compromise the quality of patient care.

Family pressure on nurses and doctors was a theme that emerged in seven studies [14, 15, 17, 18, 20–22]. The influence of residents' families can result in increased pressure to hospitalize a resident, to have a doctor assess a resident or to prescribe an antibiotic [15, 20]. The fear of ill consequences for residents or litigation from the family was reported as impacting on decision making by doctors [18, 22]. Some cultural differences within this theme were found, as participants reported that family wishes had more influence on doctors' treatment decisions in the USA than in the Netherlands [21].

3.3.3 Antimicrobial Resistance

The influence of AMR on antibiotic prescribing was raised in only three studies [15, 20, 22]. Walker et al. [20] reported that many nurses and doctors appreciate the need for information to reduce AMR, but there was no further elaboration around this in relation to antibiotic prescribing. In the study conducted by Russell and Gallen [22], the issue of AMR centred on methicillin-resistant *Staphylococcus aureus* (MRSA), primarily in relation to the knowledge of testing and treating MRSA. The doctors in this study felt that their prescribing patterns had changed in recent years but not as a result of MRSA or public health concerns. The most recent study, by Lim et al. [15], presented mixed views in relation to AMR. Some doctors reported little experience with multidrug resistance (MDR)

in their practice [15]. Other doctors reported increased incidence rates of recurrent UTIs, catheter usage, antibiotic prophylaxis and chronic wound colonization [15]. Only a small proportion of nurses in this study were concerned with AMR, with the main concern being "infection control efforts in preventing MDR organism transmission" [15]. This study found that only a minority of doctors were concerned that AMR would impact on their choice of empirical antibiotics [15]. The views of pharmacists included in the study regarding AMR were not presented.

3.3.4 Knowledge and Prescribing Practices

In all studies, the level of knowledge about infections and antibiotics was reported as varying between health care professionals [14–18, 20–22]. Walker et al. [20] specifically investigated why antibiotics are prescribed for asymptomatic bacteriuria. They noted that many misconceptions exist in practice about the symptoms of UTI and that doctors' and nurses' views regarding positive dipstick test results vary [20]. The ambiguity around interpretation of urine sample results was reiterated in other studies [14, 17, 18, 20, 22]. In many cases, it was suggested that a UTI was presumed to be present if a patient's behaviour had changed or if the urine had a strong smell or concentration [17, 18, 20, 22]. Walker et al. [20] found that some doctors would prescribe an antibiotic for an asymptomatic patient if the urine culture was positive. Nurses in one study reported different prescribing practices between doctors, with some doctors being more reluctant to prescribe than others, regardless of the patients' clinical presentation [20].

The studies by Carusone et al. and Lohfield et al. [14, 16, 17] evaluated the implementation of pathways for pneumonia and UTI, respectively. The aims of the trials included reducing antibiotic prescribing. This suggested existing knowledge on the part of the researchers that antibiotic prescribing was not performed optimally in the LTCF setting. The lack of implementation of guidelines for treating UTI or MRSA was explained by a lack of awareness of the guidelines by doctors [22]. Across all health care professional groups, the main focus of decision making was on accurately diagnosing an infection and then deciding whether or not to prescribe an antibiotic. The detail of the prescribing process, in terms of the antibiotic choice, dose and duration of treatment, was not a focal point across the studies. The issue of prescribing broad-spectrum antibiotics for the elderly in LTCFs was justified by doctors in the most recent study [15]. Pharmacists in this study also raised their concern regarding prolonged durations of prescriptions [15]. In general, this review found that many study participants were of the opinion that antibiotic prescribing in their LTCF is "probably about right". Any negative opinions about antibiotic prescribing were often made in criticism of other health care professionals rather than self-criticism [15].

One study reported the views of doctors who felt that the standards of care in some LTCFs were insufficient. In this particular study, there seemed to be a "strain in the relationship between nursing home staff and GPs [general practitioners]", even though all participants were from different LTCFs [22]. Such a finding was not reported in any other study.

Cultural differences in the care of residents with dementia who had pneumonia were noted between participants of a study conducted in the USA and the Netherlands [21]. The USA physicians were reportedly more inclined to hospitalize residents and to defer to the families' decisions. In the Netherlands, physicians were more likely not to hospitalize and reported giving instruction to the family regarding the best decision for the resident. While this sub-theme was linked to the social factors theme, it was more appropriately assigned as a variation in knowledge and prescribing practices between these two cultures. The importance of including that study in the review was to highlight that there may be cultural differences between countries in the processes of infection management and antibiotic prescribing for residents at the end of life in LTCFs.

3.3.5 Antimicrobial Stewardship and Changing Practices

Two studies did not investigate the influence of AMS on antibiotic prescribing [18, 21]. Walker et al. [20] recommended improving inter-professional communication and education, and this recommendation was based on the authors' own conclusions rather than the opinions of the participants. Russell and Gallen [22] made several recommendations, including a review of doctors' reimbursement for LTCF services, improvement in inter-professional relations, improvement in arrangements for sample testing and collection of data regarding antibiotic sensitivities. It was not evident that these suggestions were made by the participants.

Of the studies that addressed this issue in detail with participants, the facilitators and barriers to introducing AMS strategies in LTCFs were investigated [14–17]. The main facilitator to implementing changes in practice was the motivation and "buy-in" of health care professionals [14, 17]. Participants noted that the presence of a study leader or 'champion' would improve the implementation of a new pathway or process by providing extra support and reassurance for nursing staff [14]. In order to support the implementation of AMS interventions, it was identified that skills training and education for doctors and nurses was needed [15, 17]. The overall positive experiences of using a pathway, as reported by the participants in the trials

conducted by Carusone et al. and Lohfield et al. [14, 16, 17], provided useful information for future strategies. The nurses, medical directors and administrators could see the benefit for patients when implementing the pathways, as a faster diagnosis was made and patient care was reportedly improved [14, 16, 17]. Participants recommended that guidelines or education specifically regarding infection diagnosis and treatment in LTCFs would be beneficial [15]. Schweizer et al. [18] made specific recommendations to introduce protocols to guide the management of UTIs, including how and when to take a urine sample. It was also noted that flexibility in terms of deviating from a guideline or protocol must be allowed, as not every case is likely to fit a treatment pathway [17].

The concept and principles of AMS were welcomed by participants in most studies. The facilitators of AMS included acceptance by nurses of implementation of quality improvement initiatives and clinical pathways [15]. The pharmacists reported willingness to expand their clinical role in this area but acknowledged that funding would be required to support this [15]. The promotion of evidence-based practice was accepted by all health care professionals as being a key benefit of AMS.

Barriers to implementing AMS and raising awareness of growing AMR were identified in several studies [14–17]. The strategies involved in AMS and securing the willingness of doctors to accept policies or guidelines can affect how the interventions are adopted into daily practice [15]. Concern was expressed that non-acceptance of a strategy by doctors would be problematic for nurses who are willing to implement new strategies in the LTCF [15]. Some nurses were concerned about the extra workload and level of responsibility demanded by these strategies [16]. This related to lack of confidence and fear of change, which were highlighted by participants in one study [17]. On the other hand, it was also reported that nurses' confidence increased on implementation of the pathway, as they felt more empowered [16]. Another barrier to implementing AMS pathways was the influence of families, who could pressurize nurses and doctors to act against the pathway [17].

4 Discussion

This review is the first to systematically incorporate the findings of all qualitative investigations of antibiotic prescribing in LTCFs. This study outlines the many factors that influence antibiotic prescribing in LTCFs and also the challenges facing AMS strategies in LTCFs. The key issues are the contextual features of LTCF care, coupled with variable knowledge and practices in managing infection, which are all subject to heavy social factors. The interdependent relationship between nurses and doctors in LTCFs is a unique one, as most doctors are not on-site. It was encouraging to find that many participants in these studies welcomed the opportunity for further training or education, suggesting that there is an acceptance of change and AMS in LTCFs. One challenge in changing antibiotic prescribing behaviours in LTCFs is that many participants, as identified in this study, were not self-critical regarding antibiotic prescribing at their LTCF. This synthesis study has contributed a greater understanding of the factors influencing antibiotic prescribing in LTCFs. There was a noteworthy similarity in themes emerging from all of the included studies, which reinforces the validity of the findings of this review.

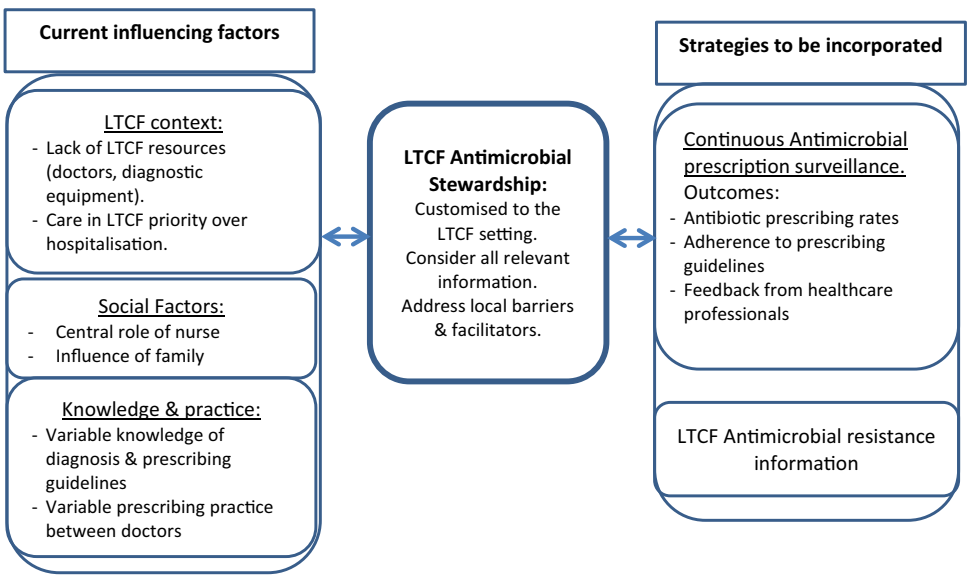

Fig. 2 Conceptual model of the factors influencing antibiotic prescribing in long-term care facilities (LTCFs) and recommendations for interventions

4.1 Analytical Theme

Through synthesis of the individual themes and descriptive themes, the overall analytical theme was generated, and a conceptual model is proposed in Fig. 2. Antibiotic prescribing in LTCFs is a process that begins before the point of actual prescribing, as it is heavily influenced by the LTCF context of care. The challenges of shared decision making between nurses and doctors, the variability in knowledge of up-to-date evidence and the social relationships underlining all of this activity have an impact on the decision about whether or not to prescribe an antibiotic. There was a notable absence of discussion about antibiotic surveillance by the participants and authors of the included studies. It is possible that continuous monitoring of antibiotic prescribing trends and practices may influence doctors and nurses by encouraging reflection and providing evidence to support AMS strategies. Evidence exists to support the effect of audits and feedback on improving prescribing practices [23]. The implementation of AMS initiatives in LTCFs will need to take into account the complexity of the context of care in this setting. It has already been established that there are numerous social, cultural and contextual factors influencing prescribing processes in LTCFs that are not present in other health care settings [24]. The factors faced by health care professionals on a daily basis, such as lack of on-site resources, will impact on the implementation of any quality improvement strategy. This has been reported in a recent AMS intervention study in North Carolina, USA [5]. The existing variability in knowledge and practices within and between LTCFs will challenge the content of AMS. It has been identified that the use of theory to inform behavioural change interventions can contribute to the success of the intervention [25]. A gap in the research identified by this review was the lack of qualitative research underpinned by a behavioural change theory or theoretical framework to explain the antibiotic prescribing behaviours in more detail. Efforts to work towards evidence-based practice must allow for local consensus and AMS strategies that are customized for the LTCF setting on the local and national levels. This will improve the likelihood of participant support for, and acceptance of, AMS in LTCFs.

4.2 Comparison with Other Research

Previous systematic reviews of qualitative research investigating opinions on and experiences of antibiotic prescribing have been conducted in the primary care and hospital care settings [8]. There are some similarities and differences in the findings between these settings and the LTCF setting. Tonkin-Crine et al. [6] found that there was often uncertainty around RTI diagnosis and management in primary care, which was also identified in LTCFs. In primary care, however, GPs have to manage pressure from patients, rather than their families, which is the case in LTCF studies. In secondary care settings, it has been reported that AMR is perceived as a national problem rather than a local one [26]. A multi-country qualitative investigation of doctors' perceptions of AMR in primary care found that most participants stated that AMR was not a problem in their practice [27]. This is mirrored to some degree in the findings of this review, as very little association between AMR and antibiotic prescribing in LTCFs was noted by the participants. An analysis of LTCF prescribing databases in Ontario, Canada, found that the duration of antibiotic prescriptions in LTCFs was largely driven by prescriber preference rather than by patient factors [28]. The variability in doctors' antibiotic prescribing practices that was identified as a theme in this review concurs with this.

4.3 Strengths and Limitations

This is the first study to synthesize the qualitative evidence on the opinions and experiences of health care professionals regarding antibiotic prescribing in LTCFs. This review complements the quantitative studies that have analysed antibiotic prescribing in LTCFs, such as the point prevalence studies conducted across Europe in recent years [29]. There were some limitations in this review. Certain included studies did not focus solely on antibiotic prescribing in LTCFs, for example. The aim of the study by Russell and Gallen [22] was to investigate factors influencing antibiotic prescribing, but a large focus of the findings related to MRSA only. The included studies were of variable quality following the application of the CASP appraisal tool. No study explicitly addressed researcher reflexivity, but we overlooked this. In the case of this review, the emergence of similar themes across all of the studies overcame this limitation. Through inclusion only of studies that related to LTCFs, the importance of the context and health care organization was protected. The synthesis of the findings in terms of discussing factors influencing AMS in LTCFs attempted to increase the clinical relevance of the review results. The findings were credible, and sufficient supportive data existed for synthesis of the findings for the purposes of this review.

5 Conclusion

This meta-synthesis review highlighted some key influences on antibiotic prescribing in LTCFs. The specific LTCF context factors, such as the relationship between the GP or nurse and the patient, restricted access to resources

and social factors (for example, the central role of the nurse) have an important impact on antibiotic prescribing in LTCFs. The need for multidisciplinary collaborative AMS strategies to address the variability in practice and knowledge, and to increase the awareness of AMR, is evident. This synthesis of existing studies may contribute important information to the development of future high-quality studies addressing antibiotic prescribing in LTCFs.

Acknowledgments This research was supported by the Health Research Board in Ireland under Grant Number PHD/2007/16.

References

1. van Buul LW, van der Steen JT, Veenhuizen RB, Achterberg WP, Schellevis FG, Essink RT, et al. Antibiotic use and resistance in long term care facilities. J Am Med Dir Assoc. 2012;13(6):568 e1–13.
2. Nicolle L, Bentley D, Garibaldi R, Neuhaus E, Smith P. Antimicrobial use in long term care facilities. Infect Control Hosp Epidemiol. 2000;21(8):537–45.
3. Kuehn BM. "Nightmare" bacteria on the rise in US hospitals, long-term care facilities. JAMA. 2013;309(15):1573–4.
4. Fleming A, Browne J, Byrne S. The effect of interventions to reduce potentially inappropriate antibiotic prescribing in long-term care facilities: a systematic review of randomised controlled trials. Drugs Aging. 2013;30(6):401–8.
5. Zimmerman S, Sloane PD, Bertrand R, Olsho LE, Beeber A, Kistler C, et al. Successfully reducing antibiotic prescribing in nursing homes. J Am Geriatr Soc. 2014;62(5):907–12.
6. Tonkin-Crine S, Yardley L, Little P. Antibiotic prescribing for acute respiratory tract infections in primary care: a systematic review and meta-ethnography. J Antimicrob Chemother. 2011;66(10):2215–23.
7. Charani E, Edwards R, Sevdalis N, Alexandrou B, Sibley E, Mullett D, et al. Behavior change strategies to influence antimicrobial prescribing in acute care: a systematic review. Clin Infect Dis. 2011;53(7):651–62.
8. TeixeiraRodrigues A, Roque F, Falcao A, Figueiras A, Herdeiro MT. Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies. Int J Antimicrob Agents. 2013;41(3):203–12.
9. Kastner M, Tricco AC, Soobiah C, Lillie E, Perrier L, Horsley T, et al. What is the most appropriate knowledge synthesis method to conduct a review? Protocol for a scoping review. BMC Med Res Methodol. 2012;12(1):114.
10. Grant M, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. Health Inform Libr J. 2009;26(2):91–108.
11. Critical Appraisal Skills Programme (CASP). Qualitative research checklist. Collaboration for Qualitative Methodologies. 2006. http://media.wix.com/ugd/dded87_29c5b002d99342f788c6ac670e49f274.pdf. Accessed 8 July 2014.
12. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med Res Methodol. 2008;8:45.
13. Tong A, Flemming K, McInnes E, Oliver S, Craig J. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Med Res Methodol. 2012;12:181.
14. Carusone SC, Loeb M, Lohfeld L. A clinical pathway for treating pneumonia in the nursing home: part II. The administrators' perspective and how it differs from nurses' views. J Am Med Dir Assoc. 2006;7(5):279–86.
15. Lim CJ, Kwong M, Stuart RL, Buising KL, Friedman ND, Bennett N, et al. Antimicrobial stewardship in residential aged care facilities: need and readiness assessment. BMC Infect Dis. 2014;14:410.
16. Carusone SC, Loeb M, Lohfeld L. A clinical pathway for treating pneumonia in the nursing home: part I. The nursing perspective. J Am Med Dir Assoc. 2006;7(5):271–8.
17. Lohfeld L, Loeb M, Brazil K. Evidence-based clinical pathways to manage urinary tract infections in long-term care facilities: a qualitative case study describing administrator and nursing staff views. J Am Med Dir Assoc. 2007;8(7):477–84.
18. Schweizer AK, Hughes CM, Macauley DC, O'Neill C. Managing urinary tract infections in nursing homes: a qualitative assessment. Pharm World Sci. 2005;27(3):159–65.
19. Longo DR, Young J, Mehr D, Lindbloom E, Salerno LD. Barriers to timely care of acute infections in nursing homes: a preliminary qualitative study. J Am Med Dir Assoc. 2004;5(2 Suppl):S4–10.
20. Walker S, McGeer A, Simor AE, Armstrong-Evans M, Loeb M. Why are antibiotics prescribed for asymptomatic bacteriuria in institutionalized elderly people? A qualitative study of physicians' and nurses' perceptions. CMAJ. 2000;163(3):273–7.
21. Helton MR, van der Steen JT, Daaleman TP, Gamble GR, Ribbe MW. A cross-cultural study of physician treatment decisions for demented nursing home patients who develop pneumonia. Ann Fam Med. 2006;4(3):221–7.
22. Russell JG, Gallen D. Influencing factors on antimicrobial prescribing in nursing homes. Primary Health Care Res Develop. 2003;4(1):69–75.
23. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD. Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database Syst Rev. 2012;(6):CD000259. doi:10.1002/14651858.CD000259.pub3.
24. Hughes CM, Lapane K, Watson MC, Davies HT. Does organisational culture influence prescribing in care homes for older people? A new direction for research. Drugs Aging. 2007;24(2):81–93.
25. Michie S, Atkins L, West R. The behaviour change wheel: a guide to designing interventions. London: Silverback Publishing; 2014.
26. Giblin T, Sinkowitz-Cochran R, Harris P. Clinician's perceptions of the problem of antimicrobial resistance in health care facilities. Arch Intern Med. 2004;164:1662–8.
27. Wood F, Phillips C, Brookes-Howell L, Hood K, Verheij T, Coenen S, et al. Primary care clinicians' percriptions of antibiotic resistance: a multi-country qualitative interview study. J Antimicrob Chemother. 2013;68:237–43.
28. Daneman N, Gruneir A, Bronskill SE. Prolonged antibiotic treatment in long-term care: role of the prescriber. JAMA Internal Med. 2013;173(8):673–82.
29. Cotter M, Donlon S, Roche F, Byrne H, Fitzpatrick F. Healthcare-associated infection in Irish long-term care facilities: results from the First National Prevalence Study. J Hosp Infect. 2012;80(3):212–6.
30. Malterud K. Qualitative research: standards, challenges and guidelines. Lancet. 2001;358:483–8.