Original Research

Pharmacists combating antimicrobial resistance: A Delphi study on antibiotic dispensing

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ABSTRACT

Background: The daily work of community pharmacists includes dispensing antibiotics, but little is known about how this should be done to ensure quality use of antibiotics.
Objective: To define specific tasks of the community pharmacist when dispensing antibiotics and to assess to what extent these tasks can be implemented in practice in Europe.
Methods: A Delphi study with community pharmacist experts in the European Economic Area. Statements on potential tasks for pharmacists during the antibiotic dispensing process were based on a systematic literature review. Participants rated the statements for importance and feasibility of implementation in practice in 3 rounds on a scale from 1 to 9. Consensus of importance was defined as ≥ 80 % of experts rating a statement between 7 and 9. An online expert meeting was conducted between rounds 1 and 2. Scores for all statements were analysed descriptively.
Results: Overall, 38 experts from 21 countries participated in the study. Experts reached consensus on 108 statements within 5 themes: 1) collaboration with prescribers, 2) checking prescriptions and dispensing, 3) counselling, 4) education, and 5) pharmacy services. Potential tasks included advising and collaborating with prescribers, performing safety checks, and having access to specific prescription information. Additionally, pharmacists should counsel patients related to the dispensed antibiotic and on antimicrobial resistance and infectious diseases. With few exceptions, pharmacists should not dispense antibiotics without prescriptions or prescribe antibiotics. Consensus on feasibility of implementation was only reached for statements in the categories "counselling patients" and "education". Barriers to changing practice included structure of the healthcare system, resistance to change from prescribers or pharmacy staff, lack of time and finances, legal barriers, and patient expectations.
Conclusion: Community pharmacists have an important role when dispensing antibiotics. This study provides important steps towards better community pharmacy antibiotic dispensing practices throughout the EEA.

1. Introduction

Pharmacists take an increasing number of tasks and responsibilities around the use of antibiotics, as the problem of antimicrobial resistance becomes more urgent. Community pharmacists are generally aware of the risks of antimicrobial resistance and they acknowledge the role of healthcare professionals in rational prescribing and dispensing.[1]

However, the implementation of antimicrobial stewardship programs seems to be lagging. Initiatives to improve community pharmacy antibiotic dispensing are uncommon and demonstrate limited effectiveness.[2] Improving quality of antibiotic dispensing aligns well with the WHO AWaRe Book that aims to improve antibiotic use in the ambulant setting.[3] But, few tools are available for community pharmacists to specifically improve their antibiotic dispensing practice. Moreover,

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there is considerable disparity between dispensing practice guidelines, with variation in practice between and within European high-income countries.[1,4–6]

In a small number of countries specific new tasks have been added to daily practice of community pharmacists. For example, independent prescribing of antibiotics by community pharmacists in the United Kingdom, Canada, New Zealand, and the United States.[7] In the United Kingdom, the National Health Service has recommended improvements of antimicrobial stewardship programs in community pharmacies, providing pharmacists with counselling checklists and patient information leaflets.[8] Implementing such advanced practice may be challenging in other European countries, given the differences in community pharmacy practice.

De Souza et al.[9] highlighted the need for the development of quality indicators to assess the antibiotic dispensing process. Using such indicators provides a better understanding of the services provided to patients and the interventions performed by pharmacists to these services.[9] This is needed to identify where practice improvements are most needed and to determine effective implementation strategies. Currently, "quality of antibiotic dispensing" has not been clearly defined in the literature. Possibly because current dispensing guidelines are not specific for antibiotic dispensing[10] or because the tasks and responsibilities of the community pharmacist are described in general terms.[11–15] Existing guidelines lack specificity[16,17] or focus only on certain parts of pharmacy practice,[7] rather than providing a complete, detailed and clinically relevant overview of what the community pharmacist should and should not do during antibiotic dispensing. Finally, recommendations are usually not specific for the European situation.[18–20] Clearly specified tasks, adaptable to different pharmacy settings in the EU, are essential to ensure consistent and high-quality dispensing practice. The COVID-19 pandemic demonstrated the ability of community pharmacists to quickly adapt to new responsibilities in practice.[21] This seems promising for improving practice on antibiotic dispensing as well. This study aims to define the specific tasks of the community pharmacist when dispensing antibiotics and to assess to what extent these tasks can be implemented in practice in Europe from a community pharmacist perspective.

2. Methods

2.1. Study design

This was a modified Delphi study, conducted from November 2022 to April 2023. The Delphi technique is frequently used to identify consensus on a specific topic among experts. This consensus can be used to develop tools that aid in training activities or clinical practice.[22] Experts of community pharmacy practice rated statements in 3 questionnaire rounds, with an online expert meeting between the first 2 rounds. Statements were established based on a systematic literature search.

2.2. Systematic literature review

The Cochrane Library, Embase, MEDLINE and Web of Science were searched in September 2022 for studies that focused on any part of antibiotic dispensing in the community pharmacy setting. Key words used were "community pharmacist" and "antibiotics" (Appendix 1). Additionally, grey literature was searched through action plans, fact sheets, frameworks, guidelines, papers, and policy letters from the European Centre for Disease Prevention and Control, the European Commission, the International Pharmaceutical Federation, the National Institute for Health and Care, the Pharmaceutical Group of the European Union, and the World Health Organization.

Studies and grey literature were included if published in English or Dutch and if they described any aspect of antibiotic dispensing in the community pharmacy setting in the EEA, Switzerland, or the United Kingdom. Studies focusing on hospital, veterinary or educational settings were excluded. Titles and abstracts of potentially relevant studies

were reviewed by 2 independent reviewers (M.L. and A.W.). Any disagreements were resolved through discussion with a third reviewer (K.T.). Similarly, full-text screening was performed independently. For all included studies, the following data were extracted through a fixed data extraction file: authors, year of publication and any information on roles, tasks, or responsibilities of pharmacists in relation to antibiotics. The latter information was categorised in statements that related to the pharmacist-prescriber relation, the pharmacist-patient relation and statements solely involving pharmacists.

2.3. Development of statements and questionnaire

The statements were composed based on the literature review using a separate statement for any task or responsibility identified. The phrasing of these statements was discussed among all members of the research group. Next, statements were organised in 5 categories: collaboration with prescribers, checking prescriptions and dispensing, counselling patients, education, and new pharmacy services. Lastly, a pilot study on these statements was conducted among 5 professionals in community pharmacy practice and research. Feedback received on readability, clarity, question flow, and length of the questionnaire was incorporated in the final version of the questionnaire.

2.4. Expert panel

Experts were invited by email through existing professional networks, international healthcare organisations and academia following a purposive sampling methodology with snowballing technique. Experts from the EEA, Switzerland, or the UK were eligible if they were trained as community pharmacists and had experience in community pharmacy practice or community pharmacy research. There were no selection criteria for specific knowledge on antibiotics. Invitees were provided with detailed information on the study, requirements and time investment, and an informed consent form to complete after accepting the invitation. The aim was to include at least one expert from each EEA country, Switzerland, and the UK.

2.5. Questionnaire rounds 1 and 2

In rounds 1 and 2, participants were asked to rate the importance of different tasks for community pharmacists when dispensing antibiotics. These rounds focused on a theoretical, ideal situation. In round 1 participants had the opportunity to suggest new statements, which were included in rounds 2 and 3. Following rounds 1 and 2, participants received a personalised email with their individual ratings and the average rating of all participants. This to allow reflection on their own opinion and that of others.[22] Any statement that reached consensus in round 1 or 2 was used for the third round of the study. Statements that were introduced by the participants in round 1 were rated for the first time in round 2 and re-rated in round 3. Demographic data on gender, occupation, years of experience and specific antibiotic training were collected during round 1.

2.6. Online expert meeting

An online expert meeting was conducted between rounds 1 and 2 to identify any unclarities in the statements and to ensure a shared understanding among participants. The aim was not to force consensus among the participants. During the meeting, statements that did not reach consensus in round 1 were presented. These statements were elucidated by the presenter (M.L.) and a reformulated statement was posed. Participants could comment on the new statement and any remaining ambiguities were resolved through discussion between the participants and the research team. These discussions were led by an experienced chairwoman (K.T.). Minutes of the meeting were sent to all participants.

2.7. Questionnaire round 3

Round 3 comprised 2 parts. First, statements introduced by the participants in round 1 that had not reached consensus during the rating in round 2 were rated. Second, all statements that were deemed important rounds 1 and 2 were rated for feasibility in daily practice. Finally, participants were asked to provide barriers towards implementation of new tasks in practice.

2.8. Data analysis

All statements were rated on a 9-point Likert scale. The scale ranged from 'completely disagree' (1) to 'completely agree' (9) or from 'definitely not feasible' (1) to 'definitely feasible' (9) with options for 'neutral' (5) and 'I do not know'. Consensus was defined as follows: if $\geq$ 80 % of the experts rated a statement 1–3 or 7–9 in rounds 1 and 2. In round 3, consensus was achieved if $\geq$ 80 % of the experts rated a statement 8–9. Statements with consensus ratings of 1–3 were deemed unimportant for antibiotic dispensing. Statements with consensus ratings of 7–9 were deemed important for practice. In the third round, statements achieving consensus ratings were considered feasible in practice.

All questionnaires were completed online in Qualtrics (Version 2023, Provo, UT, USA). Participants received personalised emails to complete the questionnaires through this platform. Anonymity of the participants was ensured. Participants were given three weeks to complete the questionnaires, a reminder was sent several days before the deadline. Data were analysed in SPSS Statistics (Version 28, Armonk, NY, USA), means, standard deviations, and the percentage of consensus were calculated for all statements.

3. Results

3.1. Systematic literature review

In the literature review a total of 2037 citations were identified, including 1052 unique studies. After title and abstract screening and full text screening 49 studies were included for data extraction. The search for grey literature resulted in an additional 24 documents for data extraction (Fig. 1).

3.2. Expert panel

Round 1 was completed by 38 experts (Table 1) from 22 countries (Appendix 2). Of those experts, 30 (79 %) completed the second round. For round 3, all experts were invited, regardless of completion of the previous rounds. Round 3 was completed by 31 (82 %) experts.
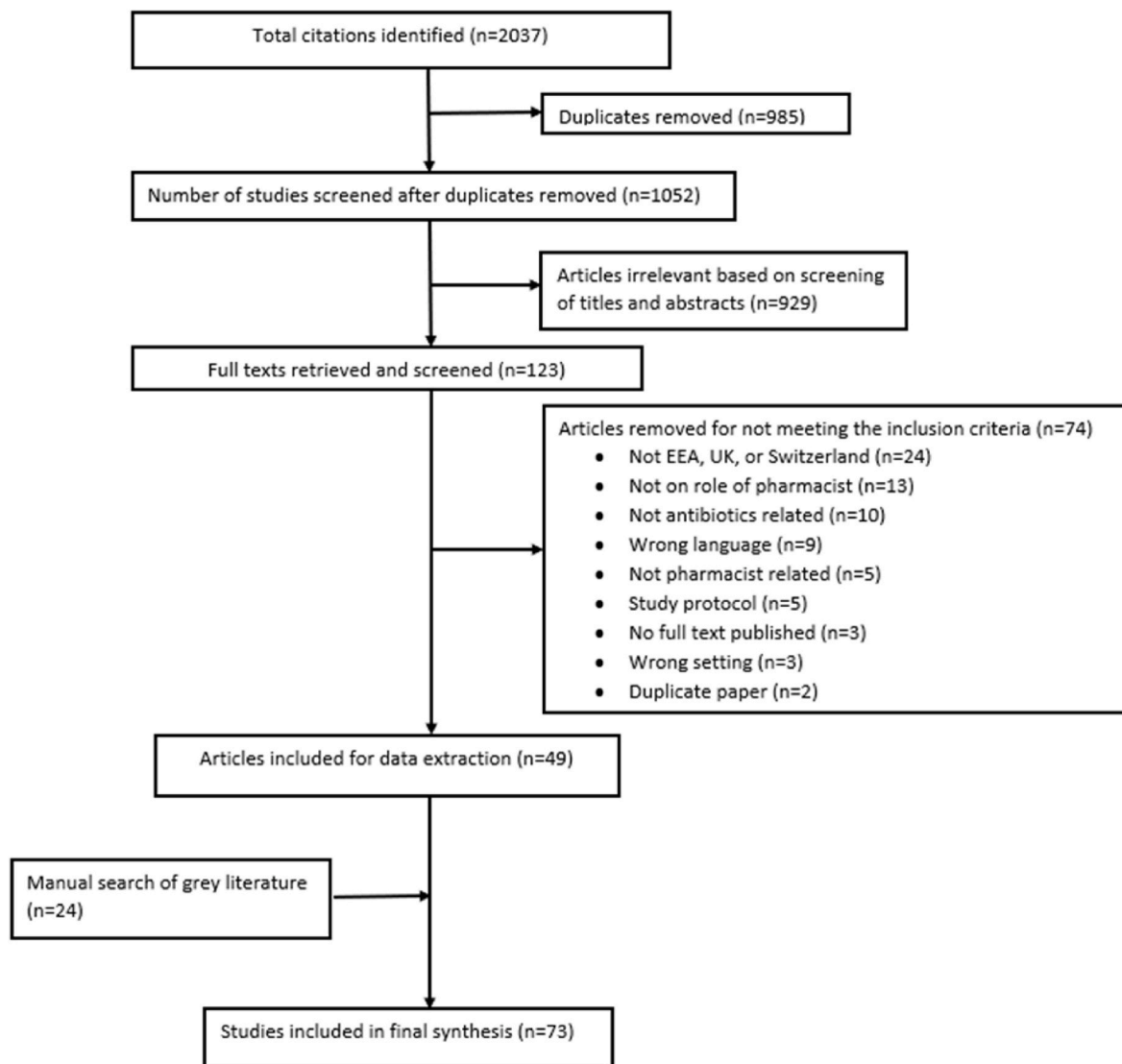

Fig. 1. Flowchart of study inclusion through systematic literature review.

Table 1
Demographic information of participants who completed round 1. N = 37, data from 1 participant are missing.

Gender	
Male	10 (27.0 %)
Female	27 (73.0 %)
Years of related work experience	
1–3 years	4 (10.8 %)
4–6 years	5 (13.5 %)
7–10 years	6 (16.2 %)
11–15 years	11 (29.7 %)
16–20 years	4 (10.8 %)
21+ years	7 (18.9 %)
Occupation	
Practising community pharmacist	19 (51.2 %)
Policy maker, trained as a community pharmacist	1 (2.7 %)
Pharmacist researcher, trained as a community pharmacist	12 (32.4 %)
Other	5 (13.5 %)

3.3. Community pharmacy antibiotic dispensing and infectious disease counselling in an ideal world

The first questionnaire comprised 97 statements. Consensus was achieved on 73 of those statements, with 71 deemed important and 2 unimportant. Consensus was not achieved for 24 statements. Thirty-three statements were created from participant input and the online expert meeting. Together, this gave 57 statements for rating in round 2. Consensus was reached for 29 of those 57 statements. In round 3, 22 statements were rated. For 6 of those statements consensus was reached, giving a total of 108 statements with consensus (Fig. 2, Supplementary file S1).

The experts reached consensus on a range of statements across the 5 categories (Table 2). They agreed that pharmacists have an advisory role towards prescribers and other healthcare professionals on different topics and should be able to contact prescribers for any antibiotic prescription. Additionally, pharmacists have a role to check prescriptions, for which they should have access to patient information. Checking prescriptions includes assessing safety items and prescription guideline adherence. There was consensus that pharmacists should not be allowed to prescribe antibiotics without consulting prescribers. Moreover, pharmacists should not dispense antibiotics without a prescription, with some exceptions for specific indications and antibiotics.

Pharmacists have responsibilities to counsel patients on a variety of topics including information on infections, correct antibiotic administration, adverse effects, storage, left-over antibiotics, and the problem of antimicrobial resistance. To provide patients with such information, pharmacists should actively look for educational opportunities, with specific focus on infectious diseases, antibiotics, antibiotic use, antimicrobial resistance, and communication. Moreover, pharmacists should take initiative in antimicrobial stewardship programs, public campaigns, and treatment guideline committees to ensure and promote rational use of antibiotics. Finally, pharmacists should offer vaccination and point-of-care test services to patients and be actively involved in preventing antibiotic shortages.

3.4. Statements on antibiotic dispensing and infectious disease counselling without consensus

In the category "education", consensus of importance was reached for all statements. In the other 4 categories one or multiple statements
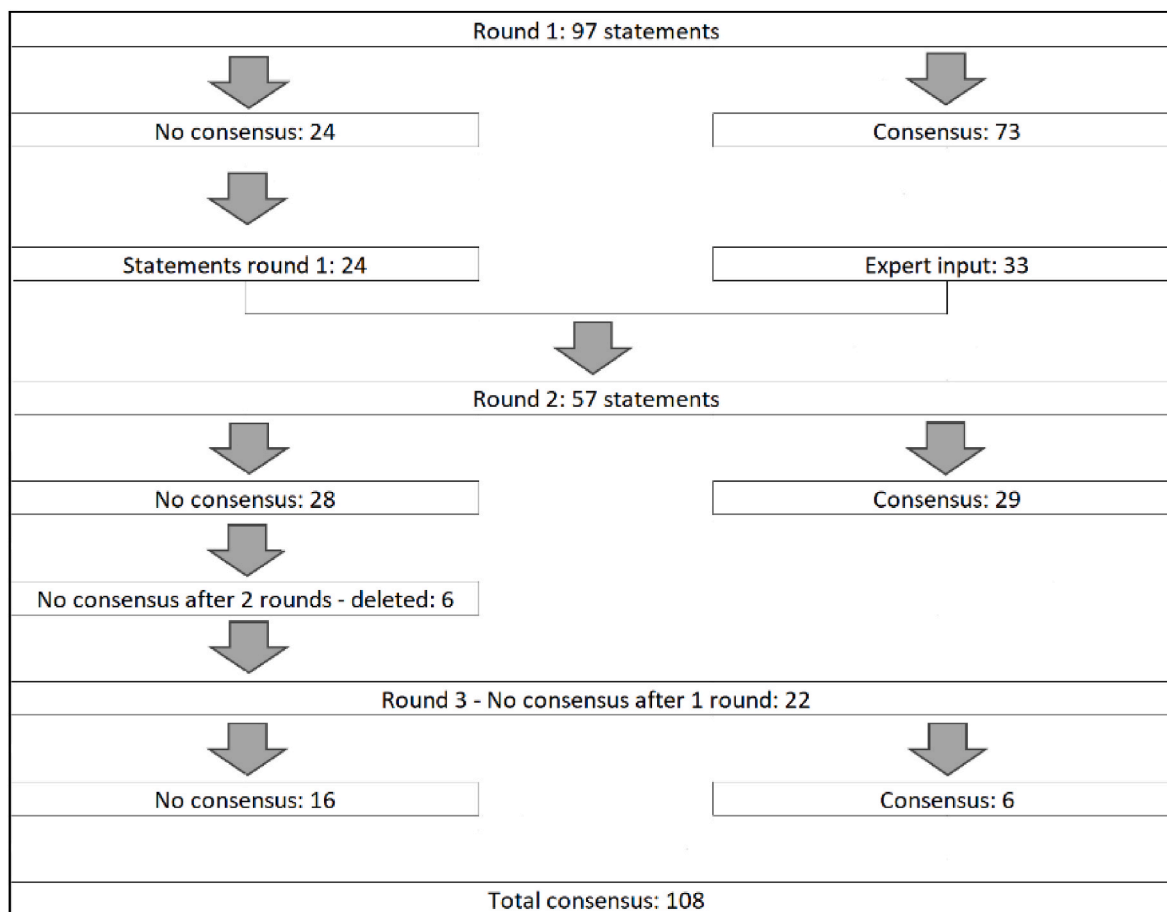

Fig. 2. Rating of statements. Rating in rounds 1 and 2 was importance of different tasks and responsibilities for community pharmacists in an ideal situation, in round 3 rating was on feasibility of implementation of those tasks and responsibilities in practice.

Table 2
Statements on which experts reached consensus of importance in an ideal world during rounds 1 and 2.

Collaboration with prescribers
The community pharmacist should:
Have agreements with prescribers on the following responsibilities for follow-up of patients with antibiotic prescriptions: treatment effectiveness, evaluating and monitoring adherence, adverse effects, patient satisfaction
Collaborate with prescribers via secured messaging systems, telephone/email, shared digital medical record systems and regular pharmacotherapy audit meetings
Advise the prescriber on modifying prescriptions (substitution, dose, duration, formulation)
Advise the prescriber on therapy changes based on kidney/liver function
Advise the prescriber on antibiotic choice (first-line, narrower spectrum, restricted antibiotics)
Update prescribers with new information on antibiotics (e.g., new antibiotics, new guidelines, treatment regimens)
Be able to contact general practitioners and other prescribers for every antibiotic prescription
Be able to contact hospital pharmacists about antibiotic prescriptions
Have an administrative role in the pre-authorization process for restricted antibiotics to check if procedures are followed
Advise the prescriber on guideline adherence
Checking prescriptions and dispensing
The community pharmacist should:
Have the following information available for every antibiotic prescription: indication, dose, treatment duration, kidney and liver function, allergies, medical history, medication use, previous antibiotic use
Know about the following safety items and act accordingly for every prescription: allergies, interactions, contraindications, comorbidities, kidney and liver function, pregnancy, breastfeeding.
Have the right to prescribe antibiotics independently for: uncomplicated urinary tract infections, tonsillopharyngitis after point-of-care test diagnosis
Dispense the exact number of tablets/capsules/etc. instead of full boxes with more tablets/capsules/etc. than needed.
Discuss a repeat antibiotic prescription with the prescriber if the pharmacist has doubts about the clinical appropriateness
Use local antibiotic prescription guidelines to check prescriptions
Check patients for recurring urinary tract infections and if eligible, advise prescribers to prescribe antibiotic prophylaxis
Counselling patients
The community pharmacist should:

Explain the following items to patients during antibiotic dispensing: when antibiotics are needed, treatment duration, dose, instructions on how to take the antibiotic, optimal time for intake in relation to meals, possible food/drinks/alcohol consumption, importance of regular intake, risk of non-adherence, adverse effects of treatment, consequences of antibiotics on microbial flora, risk of secondary bacterial or fungal infections, storage, returning left-over antibiotics
Explain the following items to patients who come in with symptoms of an infectious disease: duration of illness, viral aetiology, symptoms of self-limiting infections, prevention of infections, risk of self-medication with leftovers, symptomatic relief and self-care treatment, where and when to get help, the problem of antimicrobial resistance
Not dispense for patients without an antibiotic prescription, regardless of patients insisting or fear of losing patients' trust, but explain why they do not receive antibiotics
Provide patients with personalized oral information during antibiotic dispensing
Provide patients written information during antibiotic dispensing
Refer patients to a general practitioner when antibiotics are deemed necessary
Provide non-antibiotic self-care advice for minor illnesses.
Educate patients on immunization and vaccination.
Education
With regard to antibiotics and infectious diseases, pharmacists should be educated on pathophysiology, self-limiting infections, recurring urinary tract infections, current antibiotics on the market, mechanism of action, spectrum of antibiotics, classification of antibiotics, interactions
With regard to antibiotic use and resistance, pharmacists should be educated on local antibiotic use and resistance patterns, resistance mechanisms, regulations for antibiotics, rational use of antibiotics
Pharmacists should ensure to be up to date with new information on antibiotics (e.g., new antibiotics, new guidelines, treatment regimens)
Pharmacists should be educated on patient communication
Pharmacy services
The community pharmacist should:
Contribute to multidisciplinary antimicrobial stewardship programs with focus on health information, patient communication, and pharmacovigilance
Be involved in public awareness campaigns on the following topics: antimicrobial resistance, antibiotic use, antibiotic waste disposal
Be a member of committees that establish guidelines for the use of antibiotics
Participate in EU-wide campaigns to reduce antimicrobial resistance
Be able to dispense alternative formulations of antibiotics in case of shortages, without consulting the prescriber
Collaborate closely with prescribers on what should be done in case of antibiotic shortages, before shortages occur
Provide prescribers with a list of alternatives for antibiotics that are not available due to shortages
Strictly follow prescription-only use policies to prevent non-prescription supply of antibiotics
Provide vaccination services and point-of-care test services including streptococcus A rapid testing.
Have a private space for patient contact
Have access to clinical guidelines to prevent non-prescription supply of antibiotics
Have additional knowledge and training for independent prescribing

did not reach consensus (Table 3). On independent prescribing of antibiotics little consensus was reached. There was also no consensus on statements about collaboration with prescribers, checking of prescriptions, counselling patients and implementation of new pharmacy services.

3.5. The role of the community pharmacist in daily practice

In the third round of the study 108 statements were included. To reduce time for rating, those statements were combined to 51 statements. These were rated for feasibility of implementation in practice. For most of the 51 statements the experts believed that this was not possible. Consensus was only reached for statements in the categories "counselling patients" and "education" (Table 4). Barriers preventing

Table 3
Statements on which experts did not reach consensus of importance regarding the role of the community pharmacist on antibiotics in an ideal world.

	Statement
Collaboration with prescribers *Pharmacists should*	be able to contact the other non-prescribing healthcare workers about antibiotic prescriptions
	have agreements with other non-prescribing healthcare workers on responsibilities for follow-up of patients with antibiotic prescriptions
Checking prescriptions and dispensing *Pharmacists should*	refuse to dispense delayed prescriptions without the suggested delay
	be involved in the clinical assessment of pre-authorization for restricted antibiotics
	be responsible for the clinical assessment of pre-authorization for restricted antibiotics
	re-evaluate the antibiotic treatment within 48–72 h of dispensing
Counselling patients *Pharmacists should*	dispense a prescription antibiotic without a prescription if the patient says not to have access to a prescriber
(New) Pharmacy services *Pharmacists should*	should initiate multidisciplinary antimicrobial stewardship programs
	have the right to prescribe antibiotics independently:
	- For all infections (all antibiotics)
	- For all infections (topical use of antibiotics)
	- For uncomplicated respiratory tract infections
	- For tonsillopharyngitis in adults based on Centor criteria
	- For sinusitis in adults, if symptoms and disease course suspect bacterial aetiology
	- For acute uncomplicated cystitis
	- For chlamydia trachomatis genital infection in adults, if infection is proven by point-of-care test
	- For short term prophylaxis (e.g., dental procedure, contact of contagious bacterial infection)
	- For tick bites
	- For skin infections if symptoms yield mild bacterial infection
	- For mild conjunctivitis if bacterial aetiology is suspected
	be able to perform the following point-of-care tests:
	- Culture-based urinary tract infection tests
	- Other urinary tract infection rapid tests (e.g., dipstick)
	be able to substitute antibiotics in case of shortages, without consulting the prescriber

Table 4
Statements on which experts reached consensus of feasibility in practice regarding the role of the community pharmacist on antibiotic dispensing and infectious disease counselling.

	Statement
Counselling patients *Pharmacists should*	Provide patients with personalised oral information
	Explain to patients: when and how antibiotics are used, duration and dose, adverse effects, food and drink interactions, storage and returning left-over antibiotics
	Explain to patients: viral aetiology and prevention of infections, risks of self-medication, where and when to get help, problem of antimicrobial resistance
	Do not dispense a prescription antibiotic without a prescription
	Provide non-antibiotic self-care advice for minor illnesses
	Educate patients on immunization and vaccination
Education *Pharmacists should*	Stay educated on the pathophysiology of infections, mechanism of action of antibiotics, drug-drug interactions, classification of antibiotics
	Stay educated on resistance patterns, regulations for prescription-only and non-prescription antibiotics, rational use of antibiotics, current and new antibiotics on the market, new treatment guidelines and regimens
	Be trained in patient communication

pharmacists. In this Delphi study, experts did not see independent prescribing as an important role of the community pharmacist. However, in literature, successful implementation of independent prescribing is positively described.[7] Importantly, these findings are based on a review conducted in the United Kingdom, Canada, New Zealand, and the United States, 4 countries with a relatively well-developed community pharmacy setting compared to the majority of the countries covered by this study. In this study, experts from the United Kingdom were indeed in favour of pharmacists prescribing, but experts from most other countries were not. It appears that the role of the pharmacist in those countries should focus on prescription checking and patient education. Possible reasons for this could include the thought that allowing more professionals to prescribe antibiotics may increase the number of antibiotic prescriptions, even though this is not reported in literature.[7] Also, positive experience with pharmacist prescribing in the UK probably supports experts from the UK in their opinion to implement pharmacist prescribing wider, while experts from most other countries do not have such experience.

4.1. The future of antibiotic dispensing in community pharmacies

The role of the community pharmacist extends beyond providing medication. For many chronic diseases this role has been described more extensively. Such earlier description of pharmacist roles corresponds with the tasks and responsibilities identified by the experts in this study for dispensing antibiotics. For example, fulfilling information needs of diabetic patients,[23] prevention and detection of COPD and providing support and follow-up for COPD patients,[24] vaccinating against COVID-19,[25] and providing cholesterol point-of-care tests.[26] This more extensive role of the pharmacist for other diseases seems to imply that pharmacists should be able to provide more extensive services when it comes to antibiotics Moreover, it demonstrates that prescribers may be willing to contribute to this and patients are eager to receive it.[27]

Experts from the EEA see many different tasks and responsibilities for community pharmacists during antibiotic dispensing in an ideal world. Yet, they indicate a great difference with what is possible in practice. The experts in this study named important reasons for this difference between theory and practice, such as lack of time, staff, and finances. However, there are still many possibilities to improve current practice. Experts believed that changes can be made in the short term, especially

pharmacists from changing their practice included structure of the healthcare system, resistance to change from prescribers or pharmacy staff, lack of time and finances, legal barriers, and patient expectations.

4. Discussion

Community pharmacy experts from the EEA recognise a large role for community pharmacists on dispensing antibiotics and counselling on infectious diseases. The experts agreed that community pharmacists should collaborate closely with prescribers and other healthcare professionals, counsel patients, and provide additional pharmacy services such as point-of-care tests and vaccination services. To ensure this, pharmacists should actively seek education to stay up to date with guidelines and pharmacotherapy.

As the statements in this study were based on a systematic literature review, any role of the pharmacist on which the experts agreed is in accordance with literature. It is interesting to look at the tasks or responsibilities of the pharmacist on which the experts in this study did not agree, as these have been implemented in practice in certain settings. Specifically, one topic stands out: independent prescribing of

in the areas of patient counselling and pharmacists' education. This indicates that pharmacists already have the means and possibilities to communicate with their patients and educate them on a range of topics. But even here, barriers such as shortages of time and staff may play a role. Furthermore, to perform safety checks, certain information is needed about the medical history of patients, preferably from prescribers through linked electronic systems. Although this may often not be possible due to legal or logistic reasons, such information can also be retrieved from patients. This may not be as accurate as information from electronic patient files, but it provides pharmacists with the possibility to at least make small steps. Not surprisingly, multidisciplinary collaboration, especially with the general practitioner was seen as important, but difficult to implement in pharmacy practice. In primary care, collaboration between general practitioners and community pharmacists is seen as crucial to deliver high quality of care. Facilitating factors were found to be co-location, good communication, experience with collaboration and understanding each other's capabilities and roles.[28] To improve collaboration, changes at different levels are needed. To achieve this, it will take some courage of pharmacists to step out of the shadow of the general practitioner and become equally responsible for patient care on antibiotics and the problem of antimicrobial resistance. Finally, patient expectations from a pharmacy visit need to change. From a 30-s visit to a drug seller to a 5-min consultation with a health care professional who checks and ensures medication safety and may help prevent or treat future discomfort.

This study describes a future of antibiotic dispensing and counselling that may seem ambitious when looking at current practice. It is important to take national and regional differences in pharmacy practice into account when standardizing antibiotic dispensing. Not all the tasks and responsibilities discussed in this study may be applicable to all EEA countries. Either because pharmacy practice is already very advanced or because the baseline level of dispensing practice needs to be improved before implementing more advanced services. This research has implications for policy, research, and practice. The consensus statements are a blueprint of a practice guideline for community pharmacy practice. For implementation in a specific country, the national pharmacy association could take the lead to come to a national guideline with input from additional stakeholders. These include other primary care providers (e. g., general practitioners), other pharmacy staff (e.g., technicians), patients and patient representatives, policy makers, and insurance companies. Their perspective is needed to increase the chances of implementation of a new dispensing guideline. Pharmacist associations, e.g., International Pharmaceutical Federation and the Pharmaceutical Group of the European Union are important partners in disseminating the practice guideline among community pharmacists, other professional organisations, and the public.

Finally, these findings can be the basis to develop new antimicrobial stewardship interventions in the community pharmacy setting. Auditing the quality of pharmacy practice and providing pharmacy staff with feedback on their practice could be a first practical step for quality improvement, as described earlier.[4,29] For translating scientific studies to antimicrobial stewardship materials in practice, examples may be taken from the United Kingdom[8] or our previous research.[30] This study specifically focused on the EEA and therefore its results may not be directly extrapolated to lower and middle-income countries. To illustrate, the supply of antibiotics without a prescription is forbidden in the EEA but common practice in many lower and middle-income countries.[31] This brings different responsibilities for pharmacists that are not covered in this study. However, antimicrobial stewardship programs are also needed in these countries[32] and this study could still provide valuable lessons towards developing those.

4.2. Strengths and limitations

Strengths of this study include that it fills a gap in current literature in comprehensively collecting evidence on the role of the community

pharmacist in the EEA on antibiotic dispensing and used this to define specific tasks and responsibilities to implement in daily practice. Although general guidelines on antibiotic dispensing exist, the perspective of community pharmacy experts on specific tasks and responsibilities is novel and an important step to align practice better with guidelines. This study goes further than providing suggestions on tasks of pharmacists by giving insight in what pharmacists can do in practice and how they may do so. By including experts from a large variety of countries, the tasks and responsibilities defined in this study may be applicable to different settings throughout the EEA. Even more so because all tasks and responsibilities described in this study have a base in literature and specific countries and setting have implemented many of them. This means that implementation of the results may be based on learning from best practice from other countries rather than completely starting from scratch.

Inherent to Delphi studies are multiple limitations such as inclusion bias of experts, lack of consensus on the definition of consensus, definition of community pharmacy experts, and completion rates of the questionnaires.[33,34] The choice of the rating scale may influence the results of Delphi studies, although it is unclear what scale is best in what situation. The 9-point Likert scale is one of the more common choices and the wider range scale is useful to get first impressions of group opinions.[35] As the statements for this study were all extracted from literature and have thus been implemented in practice at least in some places, high rates of agreement were expected. Using a 9-point scale allows for some nuance between the statements even if participants would agree with the majority of them. The purposive sampling methodology may have resulted in the inclusion of experts with different levels of expertise. However, all participants were trained pharmacists and thus have insight in national dispensing practice. Moreover, experts were not included from each EEA country. Especially the lack of participants from several countries with well-developed pharmacy practice such as Germany and Sweden may have resulted in missing perspectives on more advanced aspects of antibiotic dispensing. From some countries multiple experts were included whereas from others only one was included. Additionally, as not all experts participated in the online expert meeting, there may have been a difference in the extent to which the experts were exposed to the opinions of other experts.

5. Conclusion

Community pharmacy experts from the EEA see a large role for pharmacists on dispensing antibiotics, counselling patients, and collaborating with other healthcare professionals. Yet, there is a large gap between what pharmacists should do in an ideal world and what seems feasible in daily practice. This study outlines the steps towards improving community pharmacy dispensing practices of antibiotics by defining the tasks and responsibilities and describing the extent to which they can be implemented.

Ethics

The Medical Ethics Review Board of the University Medical Center Groningen determined that the study was outside the scope of the Medical Research Involving Human Subjects Act (METc2022/476, reference number M22.304853).

Consent for publications

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article and its supplementary information files.

Declaration of competing interest

The authors declare that they have no competing interests.

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CRediT authorship contribution statement

Maarten Lambert: Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Anneloes Wonink:** Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ria Benko:** Writing – review & editing, Methodology, Investigation. **Malene Plejdrup Hansen:** Writing – review & editing, Methodology, Investigation. **Liset van Dijk:** Writing – review & editing, Methodology, Investigation. **Katja Taxis:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sapharm.2024.04.006.

List of abbreviations

EEA   European Economic Area

Appendix 1 Search strategies systematic literature review

Cochrane Library (62 hits):

((([mh Pharmacies] *OR* [mh Pharmacists] *OR* pharmac*:ti,ab,kw) *AND* (communit*:ti,ab,kw *OR* metropolitan:ti,ab,kw)) *OR* [mh "Community Pharmacy Services"])
AND
((([mh "Anti-Bacterial Agents"] *OR* anti-bacterial*:ti,ab,kw OR antibacterial*:ti,ab,kw *OR* antibiotic*:ti,ab,kw *OR* bacteriocid*:ti,ab,kw *OR* anti-mycobacterial*:ti,ab,kw *OR* antimycobacterial*:ti,ab,kw *OR* antimicrobial*:ti,ab,kw *OR* anti-microbial*:ti,ab,kw) *AND* (dispens*:ti,ab,kw))) *OR* ([mh "Antimicrobial Stewardship"] OR ("antimicrobial" NEXT stewardship*):ti,ab,kw OR ("antibiotic" NEXT stewardship*):ti,ab,kw)

EMBASE (739 hits):

((('pharmacy (shop)'/exp OR 'pharmacist'/exp OR pharmac*:ti,ab) AND (communit*:ti,ab OR metropolitan:ti,ab)))
AND
((('antibiotic agent'/exp OR anti-bacterial*:ti,ab OR antibacterial*:ti,ab OR antibiotic*:ti,ab OR bacteriocid*:ti,ab OR anti-mycobacterial*:ti,ab OR antimycobacterial*:ti,ab OR antimicrobial*:ti,ab OR anti-microbial*:ti,ab) AND (dispens*:ti,ab)) OR 'antimicrobial stewardship'/exp OR 'antimicrobial stewardship*':ti,ab OR 'antibiotic stewardship*':ti,ab).

MEDLINE (578 hits):

(((("Pharmacies"[Mesh] *OR* "Pharmacists"[Mesh] *OR* pharmac*[tiab]) *AND* (communit*[tiab] *OR* metropolitan[tiab])) OR "Community Pharmacy Services"[Mesh])
AND
(("Anti-Bacterial Agents"[Mesh] *OR* "anti-bacterial*"[tiab] *OR* antibacterial*[tiab] *OR* antibiotic*[tiab] *OR* bacteriocid*[tiab] *OR* "antimycobacterial*"[tiab] *OR* antimycobacterial*[tiab] *OR* antimicrobial*[tiab] *OR* "anti-microbial*"[tiab]) *AND* (dispens*[tiab])) OR "Antimicrobial Stewardship"[Mesh] OR "antimicrobial stewardship*"[tiab] OR "antibiotic stewardship*"[tiab])

Web of Science (658 hits):

TS=((pharmacies OR pharmacists OR pharmac*) *AND* (communit* *OR* metropolitan))
AND
TS=(((anti-bacterial* *OR* antibacterial* *OR* antibiotic* *OR* bacteriocid* *OR* anti-mycobacterial* *OR* antimycobacterial* *OR* antimicrobial* *OR* anti-microbial*) *AND* (dispens*)) OR "Antimicrobial Stewardship" OR "antimicrobial stewardship*" OR "antibiotic stewardship*")

Appendix 2 List of countries from which experts participated

- Austria
- Belgium
- Bulgaria
- Croatia
- Estonia
- Finland
- France
- Hungary
- Iceland
- Italy
- Latvia
- Lithuania
- Malta
- Netherlands
- Norway
- Poland
- Portugal
- Romania
- Slovakia
- Spain
- Switzerland
- United Kingdom

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