

Original Research

Advanced pharmaceutical services in community pharmacies

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Abstract

Background: A community pharmacist represents the most accessible healthcare provider in many countries, and community pharmacies are suitable places for patient counselling, addressing simple health issues, managing chronic diseases, offering support for non-pharmaceutical treatment, making recommendations for safe medication use, and preventing further drug-related problems. **Objective:** This review aims to summarise the types of advanced care interventions pharmacists make in community pharmacies, explore their feasibility and benefits for patients and public health, and assess the impact of these interventions on the continued development of pharmaceutical practice in community pharmacies. **Methods:** The search for relevant studies was conducted on PubMed using keywords related to pharmaceutical services in community pharmacies and excluding studies in hospital pharmacies and clinical pharmacy interventions. **Results:** This review encompasses a variety of pharmaceutical services tailored to patients/clients with diverse types of diseases. Historically, first data about advanced pharmaceutical services in community pharmacies were related to interventions for patients with cardiovascular (CV) diseases and asthma. They remained the most prevalent, and their clear positive benefits were well-documented. Scientific investigations of other advanced services were less extensive with tangible advantages but mainly depended on the intervention duration and physician-pharmacist cooperation. **Conclusions:** Advances in pharmaceutical services and their outcomes documented in scientific literature represent a shift towards addressing individual patient needs alongside the traditional roles of pharmacists. However, the field's vastness and less consistent research hinder the formulation of universally applicable recommendations or guidelines. Particularly, interventions focused on CV diseases are strong candidates for internationally valid recommendations in community pharmacies.

Keywords: pharmaceutical service; pharmacist intervention; community pharmacy; review; advanced services

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INTRODUCTION

A pharmacist in a community pharmacy serves as the most accessible healthcare provider, and, in many cases, patients seek the services of a community pharmacy before visiting a doctor for various reasons. Community pharmacists improve patients' adherence, sometimes simply by increasing their awareness of the condition.^{1,2} Providing education about inappropriate medication use, particularly in elderly patients, is beneficial in this at-risk group.³ In this context, patients place high trust in pharmacists, comprising elements such as fidelity, competence, confidentiality, honesty, and global trust.⁴ Physicians also recognise the pharmacist-physician partnership as crucial to determining appropriate drug interactions, optimising patient adherence to medications, and evaluating adverse events related to drug therapy.⁵ However, it remains unclear whether patients and healthcare providers are familiar with the services provided by pharmacists nowadays.

The preparation, storage, and dispensation of medicines, along with expert advice on their correct and safe use, or the possibilities of non-pharmacological regimen measures, have been globally expanded by other professional competences of pharmacists, gradually becoming a part of pharmaceutical care worldwide. Several studies have demonstrated that community pharmacies are a suitable place for implementing various screening programmes, contributing to the support and improvement of public health in the entire community.^{2,6-9} Due to insufficient information, many patients with a newly identified CV risk in public pharmacies do not visit their attending physician for further therapeutic procedure,⁸ highlighting the opportunities to extend pharmaceutical service toward



patient needs. On the other hand, compared to conventions in medical field, guidelines adjusting pharmaceutical procedures to be uniform in pharmacies worldwide are still only expected in the future. Predominantly, the correct executions of new competencies in different countries require comprehensive and detailed analyses.

The aims of the present review were i) to summarise the types of pharmacists' interventions in community pharmacies, ii) to explore the feasibility of these interventions as a part of advanced pharmaceutical care in community pharmacies, iii) to describe the benefits of these interventions, and iv) to assess the impact of these interventions on the further evolution of pharmaceutical practice in community pharmacies.

METHODS

In this literature review, the following keywords were applied for the article search: "community pharmaceutical services" OR "community pharmaceutical care" OR "community

pharmacy practice" OR "patient-centered pharmacy services" AND "community pharmacy" AND "community pharmacists" AND "pharmacist intervention". We included all studies describing the adult population ("19+ years"), available in "full text," and published in English language. For the overview of the pharmaceutical services' chronological development, a separate search was performed to identify early articles covering particular areas. The search was performed in the PubMed database during December 2022 and January 2023. Exclusion criteria were established, such as type of studies, *e.g.*, review, systematic review and meta-analysis were excluded. Moreover, studies from "hospital pharmacy" and studies that included in-patients in hospitals were also excluded. A manual search was performed for specialised pharmaceutical services on cognitive function in community pharmacies. Detailed information on included and excluded publications can be found in Figure 1. Maps (supplementary figures S1, S2) were created by free Datawrapper software (<https://app.datawrapper.de/select/map>).

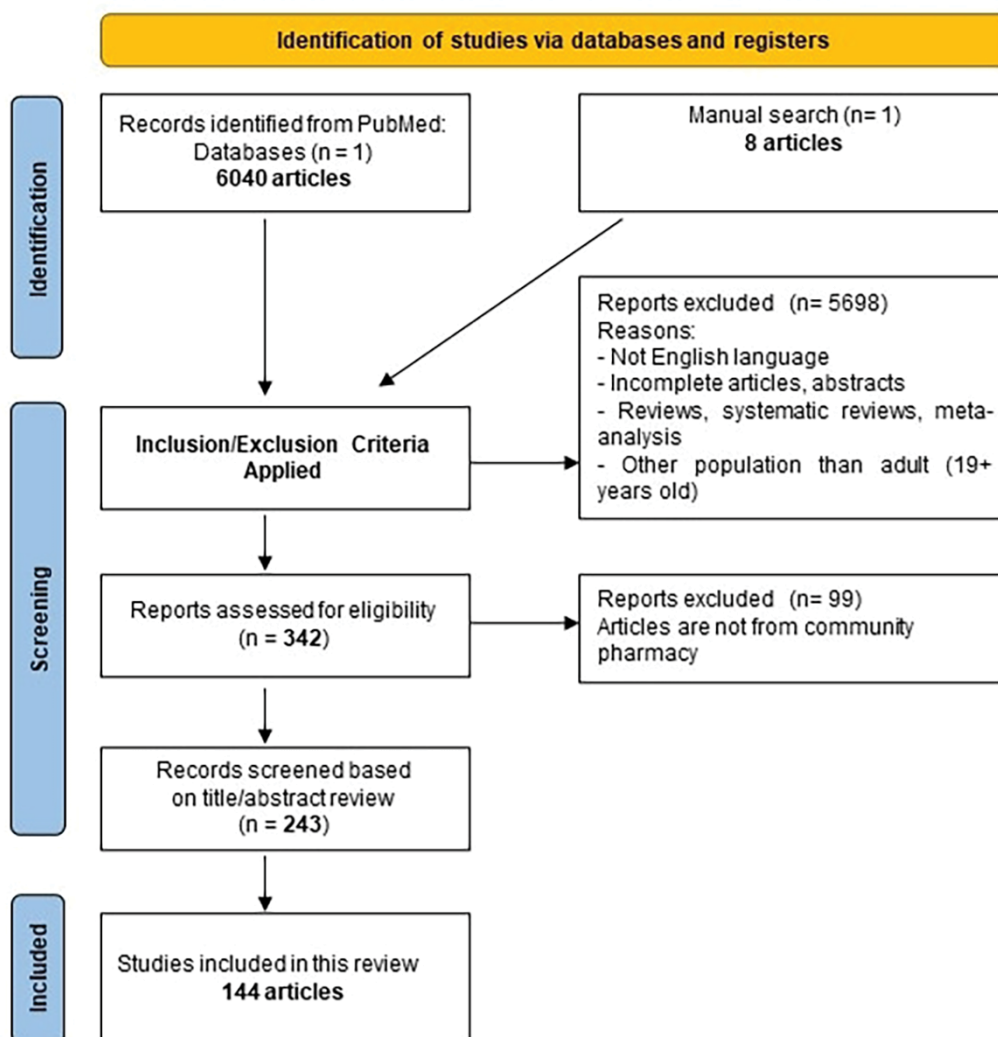


Figure 1.

RESULTS AND DISCUSSION

Development of pharmaceutical services over time

We analysed the chronological development of advanced pharmaceutical services in community pharmacies. First publications in our search were related to interventions for patients with CV diseases (hypertension, diabetes, hypercholesterolemia)¹⁰⁻¹² and asthma,¹³⁻¹⁵ including an evaluation of their economic impact.¹⁶ Specially trained pharmacists provided patient education, monitoring, feedback, and communication with physicians to address drug-related problems (DRPs); subsequently, pharmacists' interventions were enriched by special services for elderly,¹⁷ cancer-risk management,¹⁸ and counselling and treatment for head lice, all without any recommendation from general practitioner.¹⁹ In general, pharmaceutical services have been aligning with contemporary technological advances in therapy. This includes telepharmacy, telephone follow-ups, and electronic medication adherence monitoring. There has been also a focus on managing specific aspects of prevalent diseases, particularly CV conditions (e.g., weightloss, smoking cessation), and addressing the incidence of diverse health issues, such as mental disorders.

In further text, we focused on prevalent types of pharmaceutical services in detail. For a better overview, the number of papers used in this review related to advanced pharmaceutical care in European countries and worldwide can be found in Figure S1 and S2, respectively. Figure S3 shows number of studies in different categories of pharmaceutical care services. In addition, the distribution of these pharmaceutical services worldwide is summarised in supplementary table S1.

Cardiovascular health, glucose, and lipid control

As assumed, advanced pharmaceutical interventions related to CV diseases are the most frequently performed by community pharmacists. They usually cover pharmacists-led identification of CV risk factors,¹¹ CV risk assessment,^{20,21} education program and medication review for patients with polypharmacy who suffer from CV disorders,^{20,22} evaluation of the effect of pharmacists' interventions on CV risk,^{22,23} and morbidity²⁴ of these patients. These studies confirmed benefits of pharmacists' interventions in community pharmacies, such as control of global CV risk factors,²⁰ reduction of DRPs,²² and generally improved clinical outcomes.^{21,22}

The interventions encompassed individual risk factors and conditions like hypertension, diabetes, dyslipidemia, and obesity, as well as their combinations. Diabetes care management in community pharmacies consists of improved disease knowledge,^{16,25-28} lifestyle and diet change suggestions,^{26,29} patients' self-care behaviours and managements,²⁸⁻³⁵ adherence support,^{30,31,36,37} measurements of blood glucose levels,^{27,31,38} and improved glycosylated haemoglobin A1c (HbA1c) levels.^{26,28,30,31,33,38-41} The most considerable impact on HbA1c was observed when pharmacotherapy changes initiated by the physician were sustained with pharmaceutical care.²⁸ In diabetes care management, conducting long-term follow-up studies is essential to examining the sustained adherence

and improvements in self-care.³⁰ Sometimes, patients with diabetes were assessed for other cardiovascular risk factors^{27,42} and resolutions for DRPs in diabetes were determined.²⁵

Pharmacists also provided counselling and lifestyle change education to obese patients.⁴³⁻⁴⁵ The results indicated sustained benefits, evident in the 24-month follow-up period, where the combination of health and dietary education notably decreased CV risk among obese patients.^{44,45}

Interventions for dyslipidemia mainly focused on pharmacist-led education and medication adherence support^{10,46-48} and proved successful. Some studies described brief intervention tools for preventing statin non-adherence.^{49,50} Continuing intervention was found to be necessary to help patients reach the target levels, such as in the study of Yamada et al. that described low-density lipoprotein reduction maintenance one year after completion of the extended follow-up.⁵¹ Experiences involving family physicians and community pharmacists for patients with dyslipidaemia were described.⁵² However, collaborative care had no significant clinical impact on lipid control. On the other hand, another collaboration study reached a cholesterol management improvement in high-risk patients by providing pharmacists-led education, point-of-care cholesterol measurement, subsequent referral to their physician, and regular follow-up for 16 weeks.¹² Community pharmacists realised pharmaceutical support to enhance statin prescribing for secondary prevention in primary care. However, only 15% of the identified patients received statin therapy in the follow-up six months after the intervention.⁵³ A brief pharmacist-to-provider intervention significantly supported statin medication initiation and reduced rejection of statin therapy in patients with diabetes.⁵⁴ The economic impact of community pharmacists' intervention in cholesterol risk management was evaluated.¹¹ The 10-year risk of cardiovascular disease decreased from 17.3% to 16.4% within four months. These results could support the reimbursement of clinical pharmacy services in community pharmacies.

Hypertension management in community pharmacies included interventions such as specific personalised face-to-face, written, or printed patient education,⁵⁵⁻⁵⁹ training on blood pressure self-monitoring and motivational interviewing,⁶⁰ daily personalised text message reminders of medication intake,⁶¹ tablet count,⁶² lifestyle modification,⁵⁵ medication review,^{55,63} and electronic monitoring of adherence.⁶⁴ Regular checking of hypertension state in patients with antihypertension medication was carried out in Spanish community pharmacies.⁶⁵ Education on hypertension in type 2 diabetes patients moreover led to improved adherence to antihypertensives⁶⁶ and better compensation of blood pressure.⁶⁷ According to these authors, the most common barriers of adherence were forgetfulness (42%) and suboptimal or no knowledge (18%). Early identification of patients with memory impairments can predict potential DRPs. Pharmacist-led daily reminders of medication intake could be an effective tool to maintain and improve adherence in these patients.⁶¹ Other studies realized in Australia,⁵⁹ Spain,⁵⁶ and the United States⁶⁸ were focused on pharmacist-led support of home blood pressure monitoring



after an educational session provided by community pharmacists. The most accepted tool for evaluation of medication management was questionnaire,^{66,69} and the five-item Medication Adherence Report Scale was used in the study of Van der Laan and colleagues.⁷⁰ Tablet count has been also shown as an easy and similarly effective tool for evaluating of patients' adherence.⁶² The brief three-month pharmaceutical service enhanced medication adherence, yet it did not demonstrate improvement in secondary outcomes.⁶⁶ These results document that regular and continuous pharmaceutical support is essential for patients with chronic diseases. Given all this, pharmaceutical services focused on CV health, glucose, and lipid control are well implemented in routine practice in many countries worldwide, and their positive outcomes are clearly documented in literature.

Cognitive screening

Assessing cognitive features in patients with chronic disorders within community pharmaceutical services could provide valuable information about their health conditions.^{71,72} This assessment can identify patients at risk and facilitate early referral for diagnosis. Cognitive screening realized already in 2014 in the United States and subsequently elsewhere, showed that this type of a pharmaceutical activity is feasible, easily implemented,^{71,73} and presented high satisfaction.⁷¹ Although not included in the overall database, other studies related to cognitive screening and suspected metabolic syndrome evaluation in community pharmacies have been published by our team.^{74,75} Most respondents are open to cognitive testing in pharmacies, with 45% willing to pay.⁷⁶ Screening for adherence, mental health, and memory assessment could become part of a new pharmaceutical service model.⁷⁷ With their patient-centred role community pharmacists can effectively screen for mild cognitive impairment during medication dispensing, given their accessibility and frequent patient interactions,⁷² and refer risk patients to further medical control.^{78,79} Cognitive screening may be a valuable and simple tool for identifying patients with impaired cognitive performance, especially in elderly,⁸⁰ predicted DRPs, low adherence, and further complications.⁷¹⁻⁷³ However, despite some effort in the field and its potentially significant benefits, cognitive screening in pharmacies is currently rather a rare service that lacks robust data about its benefits. Some harmonisations within this service would be desirable.

Pulmonary diseases

Overall, 16 articles dealt with advanced interventions related to pulmonary diseases and were mainly focused on education and improvement of inhalation techniques in patients with chronic obstructive pulmonary disease or asthma.^{13,81-86} The study that evaluated responses to patients' cues about inhaled corticosteroids had therapeutic implications for improving medication adherence and beliefs.⁸⁷ In the American study, telepharmacy counselling was employed. It led to improved metered-dose inhaler (MDI) technique; participants also expressed higher satisfaction than the control group. In the study of Kritikos et al. a specially trained pharmacist and a pharmacist researcher trained as an asthma educator helped

improve the asthma control, MDI and dry powder inhaler compared with the usual pharmaceutical service.⁸⁸ Another study assessed the impact of the Pharmacy Asthma Care Program on asthma control and showed that a pharmacist-delivered asthma care program based on national guidelines improved asthma control.⁸⁹ Multiple studies administered questionnaires to asthma patients.^{90,91} Kovacevic et al. observed significant improvements in asthma and related medications knowledge, attitude towards medications, control scores, and level of adherence after 3 months. Better asthma control was achieved in 60% of patients, and 18% of individuals were transferred from poor to well-controlled asthma, reducing the need for doctor referrals and additional healthcare costs.⁹⁰ Participants completed a 17-item questionnaire assessing their understanding of therapy, response, and confidence in asthma care during routine visits. This study identified 68 asthma-related issues. Participants' confidence in preventing asthma episodes increased by 29%, while confidence in treating symptomatic episodes improved by 10%.⁹¹ In an Italian community pharmacy study on asthma diagnosis, adherence improved by 40% within six months through face-to-face pharmacist consultations. Additionally, the intervention's cost-effectiveness probability reached 100% at nine months.⁹² Verbal counselling, educational video, and subsequent monitoring were performed in the study of Cordina and McElroy¹⁵ and led to improved inhaler technique, fewer hospitalisations, and health-related quality of life. In a Malaysian study, applied pharmacy management service increased the number of well-controlled asthma patients and improved the inhaler technique and medication adherence.⁹³ Weinberger et al.¹⁴ described the pharmaceutical care program that provided pharmacists with recent patient-specific clinical data (peak expiratory flow rates, emergency department visits, hospitalisations, and medication compliance), training, customised patient educational materials, and resources to facilitate program implementation. After 12 months, patients receiving pharmaceutical care without instructions had significantly higher peak flow rates than the usual care group. These studies proved that pharmacists-led education improved medication adherence and patients-maintained competence in the correct inhaler technique. Thus, advanced pharmaceutical services for pulmonary diseases are generally well documented, and benefits are suggested.

Advanced pharmaceutical care in other medical conditions

The literature search revealed also diverse interventions where pharmacists can provide exciting benefits. Renal impairment can significantly affect the excretion of urine-eliminated drugs and, thus, lead to a higher risk of DRPs. We have found four studies discussing advanced care in community pharmacies for patients with renal insufficiency. Through education and training programmes, the initial number of DRPs related to patients with chronic kidney disease (CKD), such as dosing inadequacy and adherence problems, decreased.⁹⁴ Drug dosing error prevalence was also evaluated in another study,⁹⁵ particularly in elderly over 65 years taking three or more drugs, and after the intervention, the prevalence decreased. As CKD is a major CV risk factor, Canadian pharmacies aimed



to assess patient, laboratory, and treatment risk factors and provided prescription adaptations and initiations accordingly.⁹⁶ Previously, one study evaluated the use of over-the-counter medications in patients attending a predialysis clinic.⁹⁷ Their use is highly prevalent in patients with CKD and is often associated with DRPs. This study emphasised the positive effect of closer monitoring of these interactions in community pharmacies.

Osteoporosis, potentially induced also by pharmacotherapy, is another health concern. A community pharmacist screening program that involved identifying risk factors, education, and providing printed materials doubled the number of patients tested for bone mineral density, a gold standard for diagnosing osteoporosis.⁹⁸ Unlike antihypertensives or analgesics, osteoporosis medications lack noticeable and acute effects, leading to adherence issues. In total, 13 Dutch community pharmacies concentrated on this issue in patients initiating osteoporosis medication. By tailored counselling sessions and continuous monitoring of medication use they were able to decrease nonadherence and medication discontinuation.⁹⁹ Another research group identified pharmacy patients who administered glucocorticoids and provided feedback to their prescribers to begin glucocorticoid-induced osteoporosis prophylaxis.¹⁰⁰ It did not help overall, but it increased the number of male and elderly patients who initiated bisphosphonate prophylactic therapy.

Screening programs in community pharmacies can also be of high importance in other public health areas. Breast cancer addressing programs increased the performance of breast self-examination, especially in at-risk women, and increased the confidence in performing it correctly.¹⁸ Colorectal cancer screening programs providing home fecal immunochemical tests increased screening more than education alone.¹⁰¹

Pharmaceutical interventions on headache and migraine management could have delivered more improvements. The primary endpoint to decrease the number and severity of headaches by intensified structured counselling was not fulfilled,¹⁰² nor was the inappropriate use of triptans.¹⁰³ However, pharmaceutical intervention improved participants' mental health and self-efficacy.¹⁰²

Pharmacists' telephone follow-up interventions in patients undergoing antibiotic treatment did not decrease infection severity nor adherence.¹⁰⁴ On the other hand, community pharmacies in Malta enhanced adherence and reduced cost related to the wastage of unused antibiotics in short-term antibiotics treatment.¹⁰⁵

Head lice management in general practice was moved successfully to community pharmacies and represented an acceptable, effective, and cost-reducing intervention.¹⁹ Basic eye drop techniques have showed to be suboptimal in patients, and active pharmacists' service could detect and subsequently resolve such issues.¹⁰⁶

Genetic testing represents a relatively recent advance in pharmaceutical care in community pharmacies. A case study of a postmyocardial infarction patient described optimising of an antiplatelet therapy based on the results of pharmacogenetic

testing.¹⁰⁷ A recent study determined that implementing a pharmacist-led pharmacogenomics service in community pharmacies is feasible.¹⁰⁸ Challenges such as limited access to medical electronic health records, knowledge and competency, and prescribers' acceptance of recommendations are still demanding.

A specific group of community pharmacy clients are elderly, and several studies focused on interventions tailored to their needs. Ageing with polypharmacy potentiate a vulnerability for DRPs, so advanced care involves their identification, discontinuation of inappropriate medication, medication education and quality of life improvement.^{3,109-112} A multicentre study in 7 European countries reported better medication control and cost savings in elderlies after community pharmacy intervention.¹⁷ A recent study aimed to de-escalate the use of solid anticholinergics, such as urinary antimuscarinics, in elderlies due to their cognitive and physical adverse effects, such as dementia and risk of falls.¹¹³

Considering the current situation, some of the interventions mentioned earlier are futuristic, and further approval of their feasibility and efficacy is needed.

Addictions and mental health

Given the increasing prevalence of mental disorders and the frequency of psychotropic medications dispensed, community pharmacists have a daily opportunity to work with patients suffering from mental disorders and resolve mental illness stigma and other barriers that prevent these patients from accessing health care institutions.¹¹⁴ Interventions in community pharmacies related to mental health proved to decrease depression and anxiety,¹¹⁵ improved the drug attitude of depressive primary care patients,¹¹⁶ antidepressant knowledge,¹¹⁵ improved health-related quality of life,¹¹⁷ and provided adherence support.¹¹⁸⁻¹²⁰ In a Canadian observation study, pharmacists can be leveraged to increase care for mental illnesses and addictions, such as treatment optimisation, reducing polytherapy, and facilitating medication withdrawal by offering routine services without the need for an appointment and preserving patients' privacy and confidentiality.¹²¹ Moreover, the management of sleep disorders can also be improved by community pharmacists' intervention.¹²²

There were studies regarding the feasibility of an intervention in community pharmacies in the United Kingdom to reduce alcohol consumption in primary healthcare¹²³⁻¹²⁵ or manage drug addictions.¹²⁶ Motivational discussion with the patients with hazardous or harmful drinking that aimed to help reduce such behaviour was found to be feasible although the effect was only slight or none. Similarly, other authors aimed to improve methadone outcomes and limit illicit heroin use by motivational interviewing. The intervention had some positive benefits (increased communication and treatment satisfaction) but did not significantly reduce heroin use.¹²⁷

Cigarette smoking is one of the major preventable risk factors for CV and other diseases. Smoking cessation programs could be conducted as routine community pharmacy practice considering frequent smokers visits to pharmacies for their



medication. Different studies were performed or planned^{128,129} to evaluate the implementation of tobacco quitting activities (consultation, provision of nicotine patch or immediate-release bupropion) and found these interventions feasible^{130,131} as well as effective.^{131,132} On the other hand, some authors did not prove the intervention's feasibility.¹³³

Apart from some achievements in the field, mental disorder patient-centred pharmaceutical interventions are challenging as such a service requires a unique and time-consuming approach. Moreover, the expected positive outcomes are, for now, vague.

Vaccination

Another community health intervention program was concentrated on infectious diseases and vaccination. In a Japanese study, community pharmacists educated patients on the risk of influenza and the benefits of influenza vaccination. They successfully helped increase the vaccination rate and decrease the number of infected patients.¹³⁴ Patients generally accepted influenza vaccination recommendations more than non-influenza recommendations.¹³⁵ Another study did a profound medication and disease check and they recommended and administered vaccination accordingly.¹³⁶ Pharmacy staff from 99 American community pharmacies participated in vaccination interventions that consisted of face-to-face and telephonic consultations with motivational interviewing and resulted in an increased vaccination rate for influenza, pertussis, and pneumococcal infections.¹³⁷ Another study also used motivational interviewing to increase hepatitis B vaccination in diabetic patients. The vaccination rate among adults increased, and community pharmacies proved effective in providing vaccinations requiring multiple doses.¹³⁸ Nevertheless, recent study described new software to help community pharmacists improve vaccination rates, but it still needs to reach the goal.¹³⁹ Interestingly, articles about COVID-19 vaccination within pharmaceutical services did not appear in the results of our literature search, suggesting that this issue needed to be investigated more at the time of the literature search and is not linked to predefined keywords. As it is assumed that the administration of vaccinations by pharmacists or their integration into routine practice is under investigation in many countries, we can anticipate a growing number of articles addressing this issue.

Medication Therapy Management

Various articles discussed medication therapy management (MTM), which covers services provided to individual patients to optimise therapeutic outcomes, including medication review, medication education, and detection and prevention of DRPs. MTM may be optimised if pharmacists are engaged in health information exchange by reviewing unedited records.¹⁴⁰ Cooperation on medication review between pharmacists and general practitioners (GPs) was discussed in two other studies.^{141,142} The first study showed that performing treatment reviews with case conferences led to a greater uptake of clinically relevant recommendations. Related savings covered extra costs. The effect of the intervention declined over

time, so performing treatment reviews, particularly for older people, should be integrated into the routine collaboration between GPs and pharmacists. The second study measured the Quality of Life (by 36-Item Short Form Health Survey questionnaire) and Medication Appropriateness Index. Both studies improved when discussed by professionals. Medication reviews were introduced in Switzerland to improve medication use and adherence.¹⁴³ Although objective adherence was not increased, subjective adherence was. In another study on adherence, pharmacists used oral and written self-reports of non-adherence estimates associated with current and future non-adherence.¹⁴⁴ Comparison between medication by units and traditional pharmaceutical packaging showed improved adherence per unit dispensing antibiotic treatment.¹⁴⁵ For instance, comparative performance feedback to community pharmacists led to increased provision of services but did not result in higher antihypertensive adherence or reduced overuse of rescue asthma inhalers.¹⁴⁶ Similarly, no significant outcomes apart from satisfaction were reached in the study of the Community Pharmacy Medicines Management Project Evaluation Team.¹⁴⁷

Starting new medication for chronic use requires especially profound counselling to support adherence. Telephone consultation after two weeks of beginning a new medication resulted in lower non-adherence and a lower number of DRPs at a 4-week follow-up.¹⁴⁸ The positive outcomes of the intervention were also reached in long-term conditions at ten weeks.¹⁴⁹ However, no statistically significant results were demonstrated at 26 weeks, possibly due to patient attrition from the study.¹⁵⁰ The specific design of MTM can be associated with reduced DRPs.¹⁵¹ The most prevalent DRPs found in studies were CV,¹⁵²⁻¹⁵³ mental, and the need for additional therapy.¹⁵² A particular category was fall risk-increasing drugs, which is primarily a common issue in the elderly. This intervention required a comprehensive review of prescription and over-the-counter medications and recommendations to physicians.¹⁵⁴

Medication education is an integral part of pharmaceutical care. Community pharmacy intervention that consulted self-medication with patients and suggested using medication notebooks helped record self-medication details and their appropriateness.¹⁵⁵ Lam et al.¹⁵⁶ tested the effect of "Talking Pill Bottles" on medication self-efficacy, knowledge, adherence, and blood pressure readings among hypertensive patients with low health literacy. They assessed patients' acceptance of this innovation. Post-counselling retention of information was measured and interactive technique counseling reached fourtimes the odds of correctly answering when to take their medication and fourtimes the odds of correctly answering all adverse effects questions.¹⁵³ The two compared counselling methods differed only in 53 seconds of the duration. Another intervened topic in medication education was medication wastage, which counted the cost of unused medication.¹⁵⁷

Data from these studies showed some advantage of MTM in community pharmacies, mainly when pharmacists and doctors collaborated. Still, the issue is, for now, only superficially explored, and more research is needed.



CONCLUSIONS

Our literature review revealed that the current expansion of pharmaceutical care into advanced and additional services is considerably reported in scientific literature. Besides the delivery, preparation and dispensation of medicines, patients' individual needs are at the centre of interest. This overview reflects advanced pharmaceutical services of significant global health issues and culture-, country- and region-specificities. However, according to our literature search, the field is extensive, and research is inconsistent, making it challenging to create recommendations or guidelines applicable in routine practice worldwide, perhaps except for pharmaceutical services oriented on CV health, which have already undergone thorough investigation and demonstrated clear evidence of positive benefits. We suggest them for consideration for the possible issuance of internationally valid recommendations for public pharmacies.

LIMITATIONS

We acknowledge certain limitations in the presented review. As with any literature review, the selection of keywords, their

limited number, and exclusion criteria may lead to omission of some relevant papers. Another limitation lies in the intrinsic limitations of studies used for the review.

CONFLICTS OF INTEREST STATEMENT

The authors report no competing interests.

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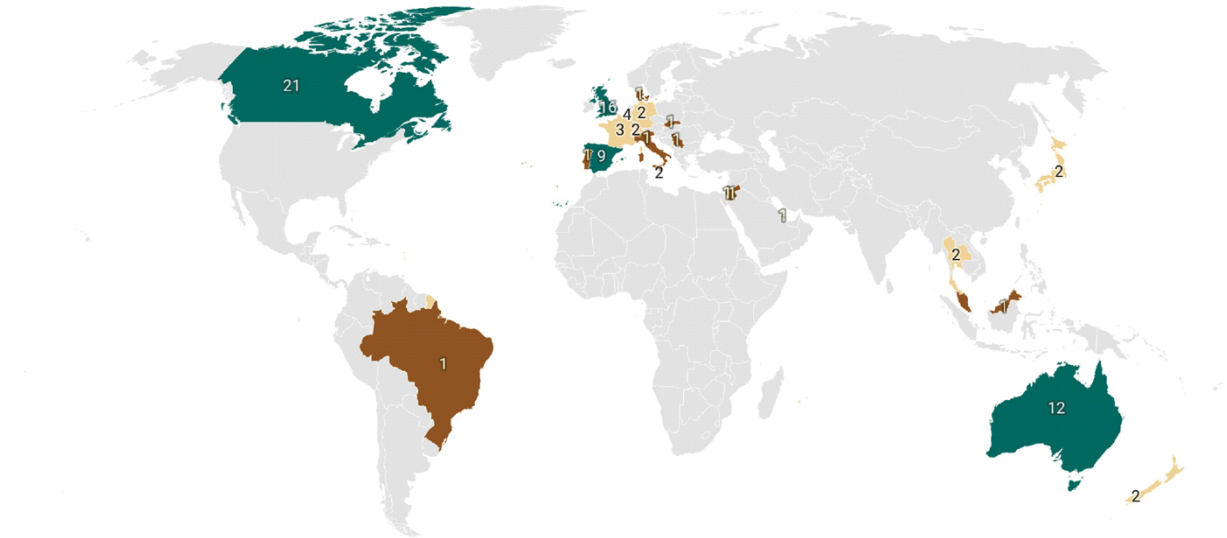


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Number of study/country

< 2 2-4 4-6 6-8 ≥ 8



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Figure S2.

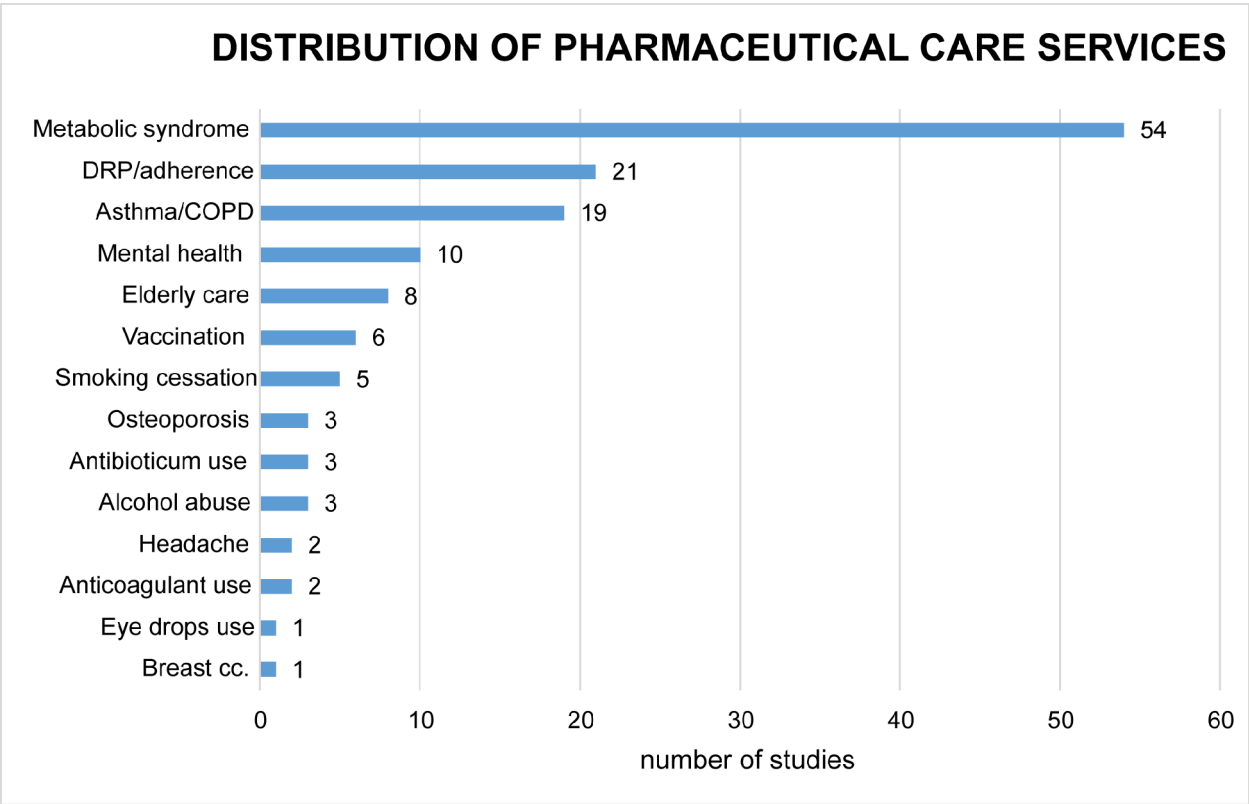


Figure S3.

COUNTRY	NUMBER OF STUDY	TYPE OF PHARMACEUTICAL CARE SERVICE										
		Metabolic syndrome	Asthma/ COPD	Elderly care	Osteoporosis	Poly-pharmacy	Vaccination	Mental health	Anti-coagulant use	DRP or/and adherence	Smoking cessation	Others
Australia	12	x							x	x		
Belgium	4			x		x						Eye drops use
Brazil	1	x										
Canada	21	x		x	x							
Denmark	1											Headache
Finland	1								x			
France	3			x								Sleep apnoe / antibiotics use
Germany	2		x									Headache
Israel	1							x				
Italy	1		x									
Japan	2						x					
Jordan	1		x									
Malaysia	1		x									
Malta	2		x									Antibiotics use
New Zealand	2											
Portugal	1	x										
Qatar	1										x	
Serbia	1		x									
Slovakia	1	x										
Spain	9	x	x	x						x		
Switzerland	2	x				x						
Thailand	2	x										
The Netherlands	12	x	x									Breast cancer
United Kingdom	16	x		x							x	Alcohol abuse
USA	37	x	x	x							x	

This table summarizes number and types of pharmaceutical care services in different countries
COPD – chronic obstructive pulmonary disease, DRP - Drug Related Problem

