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PHARMACY SERVICES IN EUROPE: EVALUATING TRENDS AND VALUE REPORT

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FOREWORD

This report is independent research commissioned by the Pharmaceutical Group of the European Union (PGEU) and prepared by a Research Team from Portugal led by the Institute for Evidence-Based Health (ISBE), assisted by an Expert Panel of Researchers from Italy and UK.

ISBE is a private independent non-profit research umbrella organization that bridges Researchers, Academia, Private Partners and Patients' Representatives, and is dedicated to the purpose of synthesizing, generating, disseminating, and translating the most relevant and high-quality scientific knowledge in health into practice.

The Pharmaceutical Group of the European Union (PGEU) is the association representing Europe's community pharmacists. PGEU members are the national associations and professional bodies of community pharmacists in 32 European countries, including EU Member States, EU candidate countries and EFTA members, representing more than 160,000 community pharmacies.

PGEU leadership and staff members were consulted to understand the context of the issue under study and collaborated on the development of the research questions and focus of this report, glossary of services and country data collection.

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Austria	Österreichische Apothekerkammer
Austria	Österreichischer Apothekerverband
Belgium	A.P.B - Association Pharmaceutique Belge/Algemene Pharmaceutische Bond
Belgium	Orde der Apothekers – Ordre des Pharmaciens
Bulgaria	Български фармацевтичен съюз
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Croatia	Hrvatsko Farmaceutsko Društvo
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Czech Republic	Česká lékárnická komora
Denmark	Danmarks Apotekerforening
Estonia	Eesti Proviisorapteekide Liit
Finland	Suomen Apteekkariliitto / Finlands Apotekareförbund
France	Fédération des Syndicats Pharmaceutiques de France
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Germany	ABDA - Bundesvereinigung Deutscher Apothekerverbände
Greece	Πανελλήνιος Φαρμακευτικός Σύλλογος
Hungary	Magyar Gyógyszerész Kamara
Ireland	Irish Pharmacy Union
Italy	Federazione Ordini Farmacisti Italiani (FOFI)
Italy	Federfarma
Kosovo	Oda e Farmacistëve të Kosovës
Latvia	Aptieku īpašnieku asociācija
Luxemburg	Syndicat des Pharmaciens Luxembourgeois a.s.b.l.
Malta	Kamra ta' l-Ispizjara ta' Malta
Netherlands	KNMP - Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie

North Macedonia	Фармацевтска комора на Македонија
Norway	NAF – Apotekforeningen
Poland	Naczelna Izba Aptekarska
Portugal	Associação Nacional das Farmácias
Portugal	Ordem dos Farmacêuticos
Romania	Colegiul Farmacistilor din Romania
Serbia	Farmaceutska komora Srbije
Serbia	Savez farmaceutske udruženja Srbije
Slovakia	Slovenská Lekárnická Komora
Slovenia	Lekarniška Zbornica Slovenije
Spain	Consejo General de Colegios Oficiales de Farmaceuticos España
Sweden	Sveriges Apoteksförening
Turkey	Türk Eczacıları Birliği
United Kingdom	National Pharmacy Association
United Kingdom	Pharmaceutical Society of Northern Ireland
United Kingdom	Royal Pharmaceutical Society

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Finally, ISBE would like to thank Mr. Duarte SANTOS, PharmD, President PGEU 2020 for challenging us to present a proposal for leading this research and, not least, for the confidence expressed in the Research Team & Expert Panel.

ACRONYMS AND ABBREVIATIONS

AT – Austria
 BE – Belgium
 BG – Bulgaria
 CBA – Controlled Before After study
 CCA – Corrected Covered Area
 CDSR - Cochrane Database of Systematic Reviews
 CEDIME – Centre for Medicines Information and Health Interventions
 CEFAR – Centre for Health Evaluation & Research
 CHD – coronary heart disease
 COPD – Chronic Obstructive Pulmonary Disease
 COVID – Corona Virus Disease
 CP – Community Pharmacy
 CRD – Centre for Reviews and Dissemination
 CS – Cross-Sectional study
 CY – Cyprus
 CZ – Czech Republic
 DARE - Database of Abstracts of Reviews of Effects
 DE – Germany
 DK – Denmark
 EE – Economic Evaluation study
 EE – Estonia
 EL– Greece
 EPOC - Cochrane Effective Practice and Organisation of Care
 ES – Spain
 FI – Finland
 FIP – International Pharmaceutical Federation
 FR – France
 GP – General Practitioner
 Hep – Hepatitis
 HF – Heart Failure
 HIV – Human Immunodeficiency Virus
 HR – Croatia
 HTA – Health Technology Assessment
 HU – Hungary
 IE – Ireland
 ISBE – Institute for Evidence-Based Health
 IT – Information Technology
 IT – Italy
 LU – Luxembourg
 LV – Latvia



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MI – Myocardial Infarction
Mix – Mixed or unclear direction of findings
MK – North Macedonia
MT – Malta
NA – Not Available
Neg – Negative direction of findings
NHS EED – National Health Service Economic Evaluation Database
NL – The Netherlands
NO – Norway
NOAC – Novel Oral Anticoagulants
NR – Not Reported
NRCT – Nonrandomized Controlled Trial
OBS – Observation
OTC – Over-The-Counter
PGEU – Pharmaceutical Group of the European Union
PL – Poland
Pos – Positive direction of findings
PPE – Personal Protective Equipment
PT – Portugal
RCT – Randomized Controlled Trial
RM – Repeated Measures study
RO – Romania
RS – Serbia
SE – Sweden
SI – Slovenia
SK – Slovakia
SR – Systematic Review
TR – Turkey
UK – United Kingdom
UTI – Urinary Tract Infection
WHO – World Health Organization
WPC – World Pharmacy Council
XK – Kosovo

EXECUTIVE SUMMARY

This research is, to our best knowledge, the first using a comprehensive mixed methods approach combining mapping of current practices of pharmacy services including interventions on COVID-19 in 32 countries in Europe with review of published evidence, hence providing a near accurate portrayal of current practices, trends and evidence of pharmacy services in Europe.

We mapped current practices on 38 pharmacy services and 30 pharmacy interventions on COVID-19 in 32 countries in Europe. We also reviewed the evidence on pharmacy services targetting more than 25 health conditions stemming from 38 systematic reviews comprising 149 primary studies. These studies were conducted in community pharmacies across Europe.

The country mapping portrays numerous and diverse pharmacy services provided in Europe. This is far beyond the dispensing roles and some services are already reimbursed in some countries. This also acknowledges the roles of pharmacies in health promotion, screening, disease, as well as in case management.

Such services reflect priorities given to efficiency (generic substitution), safety (pharmacovigilance), pharmacy expertise in preparing individualized or short expiry therapy (galenic formulation), access to medicines during out-of-hours (night services), access to chronic medication (repeat dispensing and high-cost therapy dispensing and management), ensuring safety (emergency supply, urgent supply, refusal to dispense for safety reasons), adherence (dose administration aid, instruction on the use of devices, supervised consumption of medicines, first time dispensing intervention), integrated care pathways with primary care, health promotion activities (pharmacist-delivered vaccination, smoking cessation), chronic disease management, screening and referral (screening individuals at-risk, common and minor ailment management).

The findings on current practices are aligned with recommendations described in policy papers on integrated models of primary care, patient centered, and with more economic incentives that pursue expanded roles of pharmacy services.

There is substantial evidence on pharmacy services in systematic reviews covered in this research. However, this is not without methodological challenges. This is typical of complex health interventions which operate at different levels (health systems, pharmacy settings, pharmacists, and patients) but there is room for improvement.

Positive evidence of pharmacy services stemming from systematic reviews is fairly established for screening and referral (cardiovascular risk, diabetes, asthma and COPD, depression, osteoporosis, cancers). Also, it is well established for chronic disease management (e.g. cardiovascular risk, hypertension, diabetes, lipid, asthma), medication review or medication management, smoking cessation, and therapeutic adherence support.

The findings of this overview are consistent with reported results and issues described in the other overviews of systematic reviews. In addition, these other overviews have also showed positive evidence for pharmacist-delivered flu vaccination and for pharmacists' delivered needle exchange services.

These findings are also aligned with recommendations of pursuing expanded roles and adequate remuneration of pharmacy services described in other overviews.

The European country reports portray a wide array of pharmacy interventions on COVID-19 implemented in most pharmacies. This was done in several countries within a very short time frame and reflects the highly reactive and adaptative character of pharmacies in response to the pandemic outbreak.

All 30 mapped pharmacy interventions and measures on COVID-19 have been provided throughout Europe although some more extensively than the others.

Almost all preventive measures to reduce health risks of COVID-19 (patient information, protocols for disinfection of surfaces, use of disposable masks, floor marking, and barrier at counters) have been provided in most countries.

Other frequent interventions reflected the pharmacies preparedness for stockpiling and increased demand for services and products (stock and supply of medicines,

hand sanitizers and masks), and important patient care interventions exceeding pharmacist's traditional dispensing role (symptom-based referral pathways for suspected cases, increased demand to home delivery of medicines, pharmacy telephone support to vulnerable patients during isolation and dealing with the new vulnerable patients).

Expanded powers granted to pharmacies and legislation passed in view of COVID-19 allowed pharmacies to provide services to improve access to medication and relevant products, patient screening and referral, and support to vulnerable patients.

Emergency temporary closures of pharmacies also occurred in several countries.

Research on pharmacy interventions on COVID-19 is still in its infancy stage. However, the literature has confirmed the wide array of interventions provided and expanded powers granted to pharmacies to combat COVID-19.

Pharmacy associations played an important supporting role to pharmacists by developing and updating guidance and emergency plans to assist community pharmacists.

We hope these findings may assist in improving the design, implementation, and research on pharmacy services, and in raising relevant policy questions. This could drive value-based health care that make the best use of community pharmacies.

1. INTRODUCTION

1.1. Rationale

Community pharmacy is more overt in portraying the marriage of profession and business than most other professions. Community pharmacy exhibits all the six characteristics of a profession – provides high skilled pharmacists based on theoretical knowledge; ensures training and learning; tests the competence of pharmacists; possesses organizational structure; requires adherence to a code of conduct; and encourages altruistic service. But community pharmacy is also a trading profession, as it operates to a large extent in the public eye, in the high-street, by purchasing (and pre-financing), stocking, and supplying medicines with highly qualified healthcare professionals [1].

Medication supply is the most important role of community pharmacies as it ensures safe, timely and equitable access to medicines through a trusted and reliable network and high skilled pharmacists subject to regulations, ethics, and standards of practice in all countries around the globe.

Moreover, community pharmacists have been pursuing additional complementary roles over the last 50 years. Several policy papers have also acknowledged, in recent years, the need to expand the role of community pharmacists to support healthcare systems. There are multiple reasons for this: this may be in response to inadequacies of primary health care services in health systems; pressures and budget constraints require a more effective use of health care capacities with a relevant outreach in the community; new public health challenges require a better use of health care resources.

The Joint FIP/WHO Guidelines published in 2011 already identified the mission of pharmacy practice as to contribute to health improvement and to help patients with health problems to make the best use of their medicines. These guidelines identify 6 components to this mission: 1) being readily available to patients with or without an appointment; 2) identifying and managing or triaging health-related problems; 3) health promotion; 4) assuring effectiveness of medicines; 5)

preventing harm from medicines; and 6) making responsible use of limited health-care resources [2].

Mossialos and colleagues published a landmark policy paper in 2015 that reviewed strategies to expand the role of community pharmacists in 6 countries, 3 of them in England, the Netherlands and Scotland, and recommends that future policies should focus on integrating community pharmacists into primary care, developing a shared vision for different levels of services, and devising new incentive mechanisms for improving quality and outcomes [3].

The 2019 Report from the WHO Regional Office for Europe acknowledges that the community pharmacists are the most accessible health professionals to the public and are a cornerstone of primary health care. This report also outlines that the role of community pharmacists is expanding globally. It emphasizes the population should benefit from the full potential of community pharmacies by defining roles and services aligned with healthcare needs of the community, as well as by ensuring effective remuneration for these activities [4].

The 2019 Report from OECD and the European Commission already acknowledges that the role of the community pharmacist has changed over recent years. Although their main role is to dispense medications, pharmacists are increasingly providing direct care to patients, both in community pharmacies and as part of integrated health care provider teams [5].

More recently, the 2020 Report from the OECD on primary health care recognized that even before the COVID-19 pandemic, health systems in OECD countries faced significant challenges and that in a complex context, primary health care plays a key role for health systems to deliver more and better services. The report identifies pharmacists as primary care providers in its definition of primary health care and outlines there is ample scope for further developing the role of pharmacists and develop more effective collaboration with general practitioners and other health services. The report goes further in pointing out process changes that are key to improve care: better use of digital technology, and ability to link

datasets across primary care and other part of the health systems; payment instruments linked to outcomes or desired activities; better measurement of the inputs, outputs and outcomes of the primary health care sector; patient access and interaction to their health records and accreditation of providers. The report highlights these messages are as important as ever in the light of the COVID-19 pandemic which has, in many cases, accelerated the implementation of promising innovations in primary health care to achieve a system-wide transformation of care, such as expanding the role of pharmacists. Promoting the continuity of these practices and their wider adoption as health systems move into the pandemic recovery phase is critical for making health systems more resilient to health crisis [6].

Finally, the PGEU Position Paper on a vision for Community Pharmacy in Europe for 2030 [7] outlines 10 key recommendations aligned with previous policy papers:

1. Maximise the benefits of the community pharmacist's intervention for patients and healthcare systems by promoting pharmaceutical services to improve treatment outcomes, and adherence and to minimise risks.
2. Involve community pharmacists in collaborative care models.
3. Grant community pharmacists access to all relevant patients' health information and the list of medications they are taking.
4. Consult pharmacists on the integration of new digital solutions in healthcare.
5. Allow pharmacists to help progress the digitalisation of healthcare as trusted sources for health information.
6. Support pharmacists in integrating pharmacogenomics, validated clinical rules and real-world data in their daily practice to improve patient safety.
7. Support community pharmacists in offering health screening, medicines management, health promotion and education to help reduce the overall burden of chronic diseases.

8. Establish regulatory frameworks to maximise the value of the highly accessible community pharmacies network to the communities they serve.
9. Ensure that community pharmacists can provide patients with the full range of medicines and medical devices they need.
10. Ensure that remuneration for community pharmacists properly reflects their contribution to improving pharmaceutical care, reducing the burden on other health services, and supporting the sustainability of health systems.

1.2. Background

There is a need to bring healthcare closer to primary, community and self-care [8]. This requires policies able to face the next public health challenges which, in turn, require health governance aligned with rational evidence-based decisions and multidisciplinary healthcare planning and delivery that truly apply the Kaiser pyramid care model.

The Kaiser pyramid care model illustrates that the population is stratified based on the complexity of their disease condition, for purposes of healthcare management at the community setting (self-care; disease management; and case management). This is done by using the most effective and least expensive resources by multi-professional teams in a non-integrated setting [9].

Pharmacy-based public health interventions can be defined as complex health interventions, in health promotion, disease prevention, and disease/medication management. This is provided by pharmacists to patients in the community pharmacy setting, with the aim of preventing disease, promoting health (and quality-of-life), and prolonging life, which are beyond, but not necessarily excluding, the medication supply role [10].

There is evidence of improvements in health outcomes of certain public health interventions provided by community pharmacists in appropriate collaborative

environments with physicians, however this is not without methodological challenges.

In the context of limited and scarce resources, it may be relevant to invest in public health interventions that make use of the walk-in access of pharmacies, equitable geographical distribution, high frequency of patient interactions, patients' trust, long opening hours and high skilled pharmacist workforce. This is in the context that they contribute to optimize the medicines benefits (compliance, safety, and effectiveness) and improve health outcomes at acceptable costs.

We will use interchangeably the terms pharmacy-based public health interventions and pharmacy services in this report, since the term "pharmacy services" is more frequently used by researchers in pharmacy practice and the term "public health interventions" is used more frequently in the context of health technology assessment and economic evaluation [10].

The aim of this research was to evaluate and synthesize state-of-the-art evidence, current practice, and trends in community pharmacy-based services in Europe.

1.3. Research Questions

This report attempts to answer the following research questions:

1. What is the current practice and trends in pharmacy-based public health interventions provided in community pharmacies in Europe, including recent interventions on COVID-19?
2. What is the recent evidence based on the health and economic benefits of community pharmacy patient care interventions, including recent interventions on COVID-19?
3. What are the characteristics of these studies (e.g. country, population, intervention, outcomes, study design) and direction of findings reported?
4. What are the gaps in research evidence for community pharmacy-based public health interventions?

2. BRIEF METHODS

2.1. Part 1 – Pharmacy Services

2.1.1. Mapping of current pharmacy services provided

We mapped 38 pharmacy services beyond the medication supply core role using insights from the literature and our own experience. We then, further validated this with PGEU.

These services were organized and hierarchized under the following categories adapted from the Kaiser pyramid care model according to which the population is stratified based on the complexity of their disease condition, for purposes of healthcare management at the community setting using the most effective and least expensive resources [9]:

- Dispensing related services to promote access to medicines.
- Health promotion and disease prevention services.
- Screening and referral services.
- Disease management services.
- Individual case management services.

We then added data collection on the effectiveness of new medicines, acknowledging pharmacies' role in real-world health technology assessment.

We defined key parameters to collect for each pharmacy service previously mapped and ranked.

This was the basis for the survey design for mapping country practices on pharmacy services. A glossary was included to assist in replies whilst ensuring some degree of standardization in concepts.

We pretested with PGEU, refined, and then performed the final version of country survey on current practices and trends in community pharmacy services. Replies were filled primarily by PGEU staff, based on available data, and further validated by each PGEU Member Association.

A template adapted from the survey was developed to assist in data extraction. Data was extracted by one researcher (MM) with assistance of an external researcher and reviewed by two researchers (MRH, SC).

See list of 38 mapped pharmacy services, **Appendix 1** – Country Survey Part 1: Pharmacy Services.

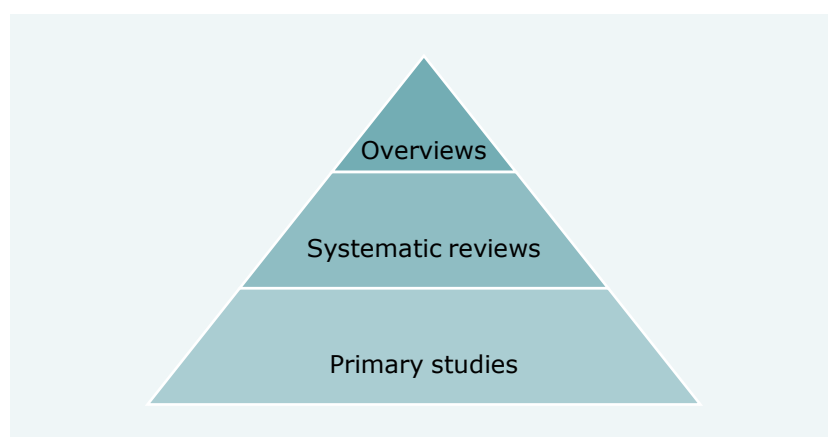
See glossary explaining these services and containing frequent synonyms used, **Appendix 2** – Glossary of Pharmacy Services.

2.1.2. Evidence on pharmacy services

We used a 3-level hierarchy of evidence comprising: overviews (or umbrella reviews) of systematic reviews; systematic reviews of primary studies; primary studies included in systematic reviews.

Box 1 depicts the hierarchical evidence of studies used in this research.

Box. 1. Hierarchical evidence of studies used



We performed a comprehensive review of overviews and of systematic reviews (reviews of primary studies) published between 2013 and August 2020. Reviews were included if they met the following criteria: 1) Systematic reviews, systematic reviews with meta-analysis, meta-analysis, or overview of systematic reviews; 2) Containing at least one study conducted in one European country; 3) Containing at least one community pharmacy or community pharmacist-based or led study

(not provided in hospital setting, clinic nor ambulatory care); 4) Focusing on patient-care interventions, services, programs, or management; 5) Reporting data on effectiveness, impact (e.g. on patient-reported outcomes and process measures), cost, cost and outcomes, cost-effectiveness, cost-utility, or cost-benefit; 6) Published as full research article.

A comprehensive search was performed by one researcher (MR) in the following databases: MEDLINE® (via Pubmed®); Cochrane Database of Systematic Reviews (CDSR); Database of Abstracts of Reviews of Effects (DARE), NHS Economic Evaluation Database (NHS EED), and HTA, via the CRD database. This search was complemented with scanning reference lists of more recent overviews. A further search was performed in Google® Scholar for recent reviews.

See search strategy, **Appendix 3** – Search strategy.

Screening of titles, abstracts and full papers was performed by one researcher (MR). Full papers were reviewed by Principal Investigator (SC). Disagreements were resolved through discussion.

A template adapted from the data extraction form was used in when a recent overview was developed and prepiloted to assist in data extraction. Data was extracted by two researchers (MR, ATR) with assistance of an external researcher and reviewed by Principal Investigator (SC).

The list of references of primary studies included in the systematic reviews was also recorded in this extraction form. We extracted data of primary studies meeting inclusion criteria provided data were reported in the systematic review, in accordance with guidelines for overviews.

Since primary studies are often included in more than one review, the degree of overlap was determined using the corrected covered area (CCA) method of Pieper et al. A CCA value lower than 5% is considered a slight overlap [11].

We assessed the overall quality of evidence: 1) for deriving effectiveness of included primary studies assisted by the Cochrane Effective Practice and

Organisation of Care (EPOC) guidelines “What study designs should be included in an EPOC review” [12]; 2) the heterogeneity of populations, interventions, outcomes, and setting, as described by Mossialos *et al* [13] and recommended by CRD for systematic reviews of public health interventions [14].

Quality assessment of included primary studies in terms of study design was first assessed based on reported information in systematic reviews and then confirmed through abstract reviews of primary studies. Quality assessment was performed by one researcher (MR) and reviewed by another (SC).

A narrative synthesis was performed. We first reported key findings of overviews and then results of systematic reviews. For systematic reviews, whenever results described countries outside Europe and/or multiple settings, we limited synthesis to the subset in community pharmacy in Europe.

2.2. Part 2 – Pharmacy interventions on COVID-19

2.2.1. Mapping of current pharmacy interventions on COVID-19

We mapped 30 pharmacy interventions on COVID-19 and further organized them under categories which correspond to the steps in response to public health emergencies. This was based on Cadogan and colleagues [15] who followed on earlier work of Watson [16] and FIP [17], and using insights from our experience:

- Prevention: measures to reduce health risks of COVID-19 pandemic.
- Preparedness: measures to ensure timely and effectively responses from the health care system.
- Response: immediate actions in response to COVID-19 pandemic.
- Recovery: measures to return to “normal” activities post-pandemic.

We also added data collection on: expanded powers granted to pharmacies; and new pharmacy services initiated.

Besides pharmacy measures and interventions on COVID-19 we were interested in understanding the economic and social impact on pharmacies by adding two

further questions on emerging temporary closures of pharmacies and deaths of pharmacy staff due to COVID-19.

We then defined key parameters to collect for each intervention previously mapped and classified.

This was the basis for the survey design for mapping country practices on COVID-19.

We pretested with PGEU, refined, and then performed the final version of country survey on current practices and trends in pharmacy interventions on COVID-19. Replies were filled primarily by PGEU staff, based on available data. This was further validated by each PGEU Member Association.

A template adapted from the survey was developed to assist in data extraction. Data was extracted by one researcher (MM) with assistance of an external researcher and reviewed by two researchers (MRH, SC).

See list of 30 pharmacy interventions on COVID-19, **Appendix 4** – Country Survey Part 2: Pharmacy Interventions on COVID-19.

2.2.2. Evidence on pharmacy interventions on COVID-19

We performed a second review of primary studies published until August 2020. Studies were included if they met the following criteria: 1) Study conducted in a European country; 2) Study reporting on community pharmacy (not hospital setting, clinic nor ambulatory care); 3) Focusing on pharmacy interventions on COVID-19; 4) Full research articles, protocols, poster abstracts, conference abstracts.

A search was performed in MEDLINE® (via Pubmed) by one researcher (MR). A further search was performed in Google® Scholar for recent studies.

Screening of titles, abstracts and full research articles was performed by one researcher (MM). Full research articles were reviewed by another researcher (SC). Disagreements were resolved through discussion.

A template adapted from the country survey was developed and prepiloted to assist in extraction. Data was extracted by one researcher (MM) and reviewed by another (SC).

We did not assess the overall quality of evidence as we have not restricted search to papers describing pharmacy interventions on COVID-19 but rather adopted a more inclusive perspective (e.g. perspectives on the role of pharmacy in COVID-19). However, we identified the design of each study.

A narrative synthesis was performed.

3. RESULTS - EVIDENCE AND TRENDS

3.1. Part 1 – Pharmacy Services

3.1.1. Mapping of current pharmacy services provided

We have received replies to Country Survey Part 1: Pharmacy Services from 32 PGEU member countries.

The top 7 most frequent pharmacy services provided in most pharmacies within the country under contract, agreement, legislation, or regulation were mostly dispensing related. This includes: generic substitution (27 countries); pharmacovigilance for medicines under additional monitoring (27 countries); galenic formulation (24 countries); repeat dispensing for chronic long-term medications (22 countries); handling and disposal of expired or unwanted medicines (20 countries); high-cost therapy dispensing and management such as for oncology, HIV, rheumatoid arthritis, multiple sclerosis (19 countries); and night services (19 countries). Some of these services were reimbursed by the government or health care payer in some (but not all) countries outside the standard pharmacy dispensing remuneration. These include: galenic formulation; repeat dispensing for chronic medications; high-cost therapy dispensing and management; night services. A few countries remunerate generic substitution.

The next tier of the 5 most frequent pharmacy services provided in most pharmacies within the country under contract, agreement, legislation, or regulation were also dispensing related (with one exception of medication review): emergency supply of prescription-only medicines without prescription such as adrenalin or salbutamol (12 countries); medication review (11 countries); urgent supply of prescription only-medicines without prescription (10 countries); refusal to dispense due to safety reasons (10 countries); and home delivery (10 countries). Medication review – the only service in this set beyond the dispensing role – is already reimbursed by the government or health care payer outside the standard pharmacy dispensing remuneration in 7 out of 11 countries providing this

service in most pharmacies. Home delivery is also reimbursed in 4 countries with a relevant regulatory upgrade in Germany due to the COVID-19 pandemic.

The third tier of the 8 most frequent pharmacy services provided in most pharmacies within the country under contract, agreement, legislation, or regulation embraces a very different and wide spectrum which goes far beyond the dispensing role. This includes: dose administration aid (8 countries); instruction on the use of therapeutic or self-monitoring devices (8 countries); needle/syringe exchange (8 countries); pharmacist-delivered vaccination (7 countries); directly observed treatment / supervised consumption of medicines (7 countries); first time dispensing intervention (5 countries); therapeutic adherence support (5 countries); integrated care pathways, protocols or quality circles with primary care (5 countries). This is a very different set of services and all are already reimbursed by the government or health care payer outside the standard pharmacy dispensing remuneration although in some (but not all) countries.

The last tier of pharmacy services provided in most pharmacies within the country under contract, agreement, legislation, or regulation includes: smoking cessation (4 countries); chronic disease management (3 countries); therapeutic substitution (3 countries); health education (3 countries); teleconsultations by pharmacists (3 countries); common / minor ailment management schemes (2 countries); screening at-risk individuals (2 countries); home or nursing home medication review (2 countries); medication reconciliation (2 countries); scheduling visits / exams, delivery of reports (2 countries); weight management (2 countries). Smoking cessation, chronic disease management, common/minor ailment management, home or nursing home medication review and weight management are reimbursed by the government or health care payer outside the standard pharmacy dispensing remuneration in at least one country.

Table 1 provides an overview of current pharmacy services provided in Europe.

Table 2 provides an overview per country.

Table 1. Current pharmacy services provided in Europe

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
DISPENSING RELATED SERVICES						
1 Night services	19 countries: AT; BE; HR; FR; IT; NL; MK; CZ; XK; LU; PT; ES; UK; EL; SK; TR; DE; CY; HU	13 countries: BE; HR; FR; IT; NL; LU; SI; ES; UK; DE; CY; MT; CZ		16 countries: BG; DK; NO; FI; XK; PL; PT; RO; SI; SE; ES; UK; RS; EE; LV; MT	2 countries: PL; SK	DK; PL - service paid for by patients. AT - This legally obliged service is not paid for by the public, on-call services cost pharmacies around 35 Mio. Euro; BE - fixed fee per night (65€) + supplementary fee (5.42€) per reimbursed delivery; patient does not pay a special fee if he has a prescription. The concept of urgency no longer exists. BG - All pharmacies are free to validate their work time. PT - Optional fee of 2.50€ per package paid for by patients when the prescription is not prescribed in the same day or the day before; night shift starts after 10pm. IT - Recently the payment for this service (at patient or NHS charge) has been updated. NO - The pharmacy may charge a fee on the purchase, which is paid for by the customer. PL - There is a maximum amount charged for night dispensing, pharmacists adds this to patient's drug bill. SI - The fee is set flat for each pharmacy and is paid monthly. CZ - Yes (from 2020), 10 mil. Kč fund is divided between these pharmacies (1815€/month/pharmacy). SK - Self-governing region pursuant legislation, in cooperation with the Slovak Chamber of Pharmacists, organizes the provision of emergency pharmaceutical services; the emergency pharmacy service is served from 16:00 to 22:00 during working days and 8:00 - 22:00 during weekends and non-working days. Upon agreement, LPS can also be used until 20:00. EE - in some cases remunerated. DE - remunerated by NNF: A share of the price of each POM package dispensed in pharmacies goes to the night-time and emergency services fund (NNF); currently 0.21 € / package. Fee calculated quarterly. MT - paid for by patients and Health Insurance Funds.
2 Emergency supply of prescription-only medicines without prescription (e.g. adrenaline, salbutamol)	12 countries: AT; DK; FR; IT; NO; IE; XK; PL; RO; UK; CY; MT		1 country: MT	2 countries: BE, PT	4 countries: FI; IE; TR; PT	NO - The pharmacy may charge a fee. UK - paid for by patients. MT - paid for by patients and Health Insurance Funds. PT - No fee-for-service. Pharmacy is entitled to the margin fixed by medicines' pricing.
3 Urgent supply of prescription-only medicines without prescription (e.g. patient on holiday)	11 countries: AT; DK; IT; NL; IE; XK; PL; RO; UK; CY; PT		1 country: UK	1 country: BE	2 countries: FI; IE	NO - Prescriptions are electronic and accessible for all Norwegian pharmacies. This service not needed.

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
4 Repeat dispensing (chronic long-term medications)	22 countries: BE; BG; HR; DK; FR; NL; NO; CZ; FI; IE; XK; SI; SE; ES; UK; EL; SK; TR; RS; CY; EE; MT		11 countries: BG; HR; FR; CZ; IE; SI; SE; ES; UK; CY; EE	2 countries: RO; ES	3 countries: DK; IE; SK	IE - paid only if covered in a reimbursement scheme. UK - remunerated by the health service. ES - Co-payments by patients applies. Product margin. GPPs are voluntary remunerated by patient or Health Service. CZ - remunerated by Health Insurance Companies as service fee. DE - There is a new legislation in place that basically sets the framework for repeated dispensing. Details on implementation currently under discussion. EE - paid for by patients and Health Insurance Fund. SE - paid for by patients and Health Service.
5 Generic Substitution	27 countries: BE; DK; FR; IT; NL; MK; NO; CZ; FI; IE; XK; LU; PL; PT; RO; SI; SE; ES; UK; EL; SK; TR; DE; RS; CY; HU; MT		5 countries: FR; IT; IE; SE; EL	2 countries: PT; LV	4 countries: BE; IE; XK; PT	IE - paid only if covered in a reimbursement scheme. FR - Incentives to reach specific public health goals (ROSP – Rémunération sur objectifs de santé publique). PT - As a mechanism to keep increasing generics market share and reduce the financial impact to pharmacies, the government introduced a financial incentive to pharmacies: 0.35€ per pack dispensed (applied to the 4 cheapest medicines in each reference group – same INN, same strength, same pack size). This fee is linked to generated savings; It is up to the Portuguese Medicines Authority to keep an online updated list of the medicines. IT - Pharmacy has an incentive to dispense the cheapest drug inside each transparency list. SE - remuneration considered to be part of the dispensing fee. EL - If the value of generic medicines exceeds the mean generic substitution performed, a 0.3% of the exceeding value should be paid to the pharmacy.
6 Refusal to dispense due to safety reasons	10 countries: BE; FR; NL; NO; FI; IE; SI; ES; SK; RS		1 country: FR	20 countries: AT; BG; DK; IT; MK; NO; CZ; XK; LU; PL; PT; RO; UK; EL; DE; CY; EE; HU; LV; MT	2 countries: SI; SK	TR - According to the regulation the pharmacists should get in touch with the doctor to clarify the safety reasons (dosage/medicine etc.)
7 Home delivery	10 countries: BE; DK; FR; IT; NL; NO; SE; UK; DE; MT		4 countries: NL; UK; DE; ML	19 countries: AT; MK; NO; CZ; FI; IE; XK; LU; PL; RO; SI; SE; ES; SK; TR; EE; HU; LV; PT	2 countries: CZ; PT	DK; FI; PT; SE; EE; HU - paid for by patients. MT - paid for by patients, health Service and Health Insurance Funds. DE - During the peak phase of the corona pandemic between Apr and Sept 2020, pharmacists received an expense of 5€ + VAT for each medicine delivery. As of October 1, the remuneration will be reduced to 2.50€ + VAT and is valid until 31 Dec 2020. Regulation: Ordinance on the Operation of Pharmacies (§ 17 (2)). EE - 1 of 521 pharmacies. HU - This service is provided voluntarily by pharmacies (5%).
8 Other _____	5 countries: AT; FR; NL; IE; UK		2 countries: NL; IE			NL - Fee for pharmaceutical care like clinical rules implementation, measurement of kidney function with point-of-care testing, etc. (depending which contract the community pharmacist has with the health insurer. IE - Pharmacy receives consultation fee plus dispensing fee when Emergency Contraception Service (EHC) supplied to eligible patients. UK - EHC remunerated by local authorities

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
HEALTH PROMOTION SERVICES						
9 Handling and Disposal of Expired or Unwanted Medicines	20 countries: BE; HR; DK; FR; NL; NO; CZ; FI; LU; PT; RO; SE; ES; UK; EL; SK; RS; EE; HU; MT		3 countries: IE; SE; UK	9 countries: AT; IT; IE; XK; PL; PT; TR; DE; LV	1 country: SK	IE - Some health boards pay for the service, otherwise, pharmacies pay for the collection themselves. MT - paid for by patients
10 Needle/Syringe Exchange	8 countries: AT; HR; FR; NL; PT; ES; SK; CY	1 country: IE	4 countries: IE; PT; ES; UK	5 countries: BE; DK; FI; PT; UK	1 country: SK	PT - Remunerated by the National Health Service: After a one-year evaluation of the programme by an independent entity (Faculty of Economics of University of Porto) and also by a consortium ANF CEFAR/Univ. Lisbon CEMBE, Portuguese pharmacies are (since 01/01/2017) remunerated by Portuguese Health Service, in 2.40 € for each kit dispensed.
11 Pharmacy Travel Health	1 country: NL			29 countries: AT; BE; BG; HR; DK; FR; IT; NL; MK; NO; CZ; IE; LU; PL; RO; SI; SE; ES; UK; EL; SK; TR; DE; RS; CY; HU; LV; MT ; PT		
12 Pharmacist-delivered vaccination (e.g. Flu)	7 countries: DK; FR; NO; IE; PT; UK; EL	2 countries: LU; DE	5 countries: DK; FR; IE; UK; DE;	3 countries: NO; PT; MT	1 country: FI	PT -paid for by patients; Flu vaccination in pharmacies as vaccination points of public NHS under an agreement with the Ministry of Health to further integrate them into the public National Health Service (NHS), the Directorate-General for Health convened a group of 39 community pharmacies to collaborate as vaccination points against influenza. The pilot took place in the municipality of Loures, in Lisbon, between 15th Oct and 31st Dec 2018. This pilot aimed at increasing the flu vaccination in people aged ≥65 years by improving access to the vaccination through pharmacies with no need for a vaccine prescription. The project was financed by ANF. SK - The Slovak Chamber of Pharmacists supports the introduction of influenza vaccination in pharmacies. However, pharmacists in SK do not yet have this competence. MT - paid for by patients. NO - service paid for by patients
13 Weight Management	2 countries: IE; PT		1 country: UK	23 countries: AT; BE; BG; HR; IT; MK; FI; LU; PT; RO; SI; SE; ES; UK; EL; SK; TR; DE; RS; EE; HU; LV; MT		PT - paid by patients in some cases. SE - 80 SEK, paid by patients. UK - remunerated by CCG.

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
14 Smoking Cessation	4 countries: FR; IE; PT; UK	1 country: NO	2 countries: UK; DK	23 countries: AT; BE; BG; HR; DK; IT; NL; MK; CZ; FI; XK; PT; RO; SI; SE; ES; EL; SK; TR; DE; RS; EE; HU		DK - paid for by patients or municipality. FI - In some cases paid for by patients. CZ - remunerated by Health Insurance Companies as fee. SE - paid for by patients. UK - commissioned and remunerated locally
15 Health education	4 countries: HR; FR; IE; PT		1 country: FR	29 countries: AT; BE; BG; DK; IT; NL; MK; NO; CZ; FI; XK; LU; PL; PT; RO; SI; SE; ES; UK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT		FR - remunerated by the Regional Health Agency
16 Other _____		1 country: IE				
SCREENING AND REFERRAL SERVICES						
17 Common Ailment Management Schemes (e.g Strep-A, UTI / Cystitis)	2 countries: FR; UK	1 country: RS	1 country: UK	5 countries: SE; ES; SK; RS; PT		SE - Allergy check up – 450 SEK (patient); Birth mark control (300 - 350 SEK).
18 Screening individuals at-risk not on medication (e.g. for diabetes, hypertension, lipid disorder, HIV, Hep B, Hep C, colon cancer)	2 countries: PT; ES	7 countries: BE; FR; IT; IE; PL; PT; RS	2 countries: FR; IT	26 countries: AT; BG; HR; DK; FR; IT; NL; NO; CZ; IE; XK; LU; PL; PT; SI; SE; ES; UK; EL; SK; TR; DE; EE; HU; LV; MT		FR - by the Regional Health Agency, in case of regional screening campaigns involving pharmacists. IT – The colo-rectal screening service (18% of pharmacies). is remunerated by the Health Service. Other screening services such as for diabetes are remunerated by patients. SE - paid for by patients - Diabetes 125 SEK, Hypertension 60 – 80 SEK (discount for “club members”), Spirometry 80 SEK. UK - In some cases paid for by patients.
19 Predictive medicine (e.g. genetic risk)		1 country: NL				
20 Pharmacovigilance for medicines under additional monitoring (e.g. screening questions for black triangle medicines)	27 countries: BE; DK; FR; IT; NL; MK; NO; CZ; FI; IE; XK; LU; PL; PT; RO; SI; ES; UK; EL; SK; TR; DE; RS; EE; HU; LV; MT			1 country: XK		
21 Scheduling visits / exams, delivery of reports	2 countries: ES; IT	2 countries: SK; RS		5 countries: CZ; IE; ES; SK; RS		CZ - In some cases, paid for by patients.

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
22 Referral to other healthcare providers (e.g. nurses and nutritionists)	2 countries: BG; ES			29 countries: AT; BE; HR; DK; FR; IT; NL; MK; NO; CZ; FI; IE; XK; LU; PL; PT; RO; SE; UK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT		
23 Other: Sale / supply of self-test kits to patients / public	10 countries: FR; IT; NO; FI; LU; PT; SE; ES; TR; MT		2 countries: FR; CZ	10 countries: IT; NL; CZ; FI; PT; SI; SE; SK; EE; HU		NO - Sale / supply of self-test kits are paid by the patients. FI - In pharmacy point of patient access to health services: remunerated by patient. SK - paid for by patients; Remuneration is based on the margin. TR; EE - paid for by patients. MT - Sale / supply of self-test kits to patients / public: paid for by patients or Health Service; In pharmacy point of patient access to health services: remunerated by Health Service
DISEASE MANAGEMENT SERVICES						
24 Administering injectable medicines (e.g. antibiotics)	1 country: PT			1 country: PT	1 country: PT	SK - Intravenous administration of drugs is performed only in hospitals or outpatient clinics.
25 Directly observed treatment/ Supervised Consumption of Medicines	7 countries: AT; BE; FR; NL; NO; ES; UK		6 countries: AT; BE; FR; NO; IE; UK	7 countries: DK; IE; PL; SE; ES; DE; MT	1 country: IE	DK; MT - paid for by patients
26 First time dispensing intervention (e.g New Medicines Service)	5 countries: BE; DK; NL; NO; UK	6 countries: IT; NO; FI; IE; PT; SE	5 countries: BE; NL; UK; DK; NO	4 countries: DK; FI; PT; MT	1 country: BE	UK - remunerated by National Health Service. DK - Remunerated according to the agreement with the Ministry of health
27 Instruction on use of therapeutic, self-monitoring device or medical aid (e.g. stoma appliance, inhaler, insulin device, self-monitoring blood glucose)	9 countries: FR; NL; NO; IE; SI; SE; ES; EL; PT	2 countries: PT; RS	3 countries: FR; NL; NO	25 countries: AT; BE; BG; HR; DK; IT; MK; CZ; FI; XK; LU; PL; PT; RO; ES; UK; SK; TR; DE; RS; CY; EE; HU; LV; MT		AT; BE; BG - This can be part of standard pharmacy practice but there is no structural framework or regulations around this service. NL - this included in the fee for first time dispensing
28 Therapeutic adherence support	5 countries: BE; DK; NL; IE; ES	2 countries: ES; RS	2 countries: DK; PT	16 countries: IT; MK; NO; FI; XK; LU; PT; RO; UK; EL; SK; TR; DE; RS; LV; MT	2 countries: BE; SK	PT - Preparation of personalized dosage systems paid by Águeda Municipality
29 Teleconsultations by pharmacists	3 countries: FR; NL; SE	2 countries: IT; IE	1 country: FR	12 countries: BG; DK; IT; NO; CZ; XK; SI; SK; DE; RS; EE; MT		BG - This can be part of standard pharmacy practice but there is no structural framework or regulations around this service.

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
30 Chronic disease management (e.g. hypertension, hyperlipidemia, diabetes, asthma, COPD, NOAC)	3 countries: BE; FR; NL	2 countries: LU; RS	3 countries: AT; BE; FR	25 countries: AT; BG; HR; DK; IT; MK; CZ; FI; LU; PT; RO; SI; SE; ES; UK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT		AT - remuneration in some cases: Management of hypertension could be remunerated partly by health insurance. BG - This can be part of standard pharmacy practice but there is no structural framework or regulations around this service. CZ; DE; MT - In some cases paid for by patients.
31 Other: Information to patients on conditions / treatments	3 countries: FI; UK; TR		1 country: NO	6 countries: NL; NO; CZ; PL; SK; HU		CZ - Wound healing: In some cases, paid for by patients.
INDIVIDUAL CASE MANAGEMENT SERVICES						
32 Dose Administration Aid	8 countries: BE; DK; FR; NL; NO; FI; IE; UK	1 country: HR	5 countries: NL; FI; IE; LU; SE	11 countries: AT; IT; MK; LU; PT; SE; ES; SK; EE; HU; MT		AT - paid for by patients or free service from pharmacy. IE - remunerated if patient is accepted by reimbursement scheme. PL - In community pharmacy pillboxes are not available. Few hospital pharmacies using the unit-dose system. TR - This service may refer to broken bulk dispensing which can be provided only by hospital pharmacies. MT - paid for by patients and Care Homes. SE - It is also available as a "private customer service" paid for by patients and Health Service; private consumers pay 99 SEK/month.
33 Medication Review	11 countries: DK; FR; IT; NL; NO; CZ; PT; SI; ES; UK; DE	4 countries: NO; LU; DE; RS	7 countries: AT; DK; FR; NL; LU; SI; UK	7 countries: AT; FI; SE; SK; RS; EE; MT		AT - Remunerated by patients or private health insurance. DK - paid for by patients or municipality. CZ -. In some cases, paid for by patients. DE - So far only remunerated in pilot: <u>ARMIN</u> . LU - only for asthma FI - paid for by patients. SI - This service is regulated by the Pharmacy Practice Act and based on doctor's referral TR - There is no structural framework or regulations, but it is supported and done by volunteer pharmacists.
34 Home or Nursing Home Medication Review	2 countries: DK; NL	1 country: AT	3 countries: DK; NL; FI	7 countries: FR; IT; NO; FI; IE; PT; DE	1 country: CZ	FI - fee based on contracts with care units. PT - paid for by patients.
35 Medication Reconciliation	3 countries: NL; IE; PT	1 country: ES		3 countries: BE; FI; SE		NL - Admission and discharge fees for pharmaceutical care at hospital treatment that does not include hospital admission but no remuneration for community pharmacist.
36 Therapeutic Substitution	3 countries: FR; NL; ES			3 countries: FR; TR; CY		
37 Deprescribing (e.g benzodiazepines, antidepressants)		2 countries: NL; DE		1 country: IE		
38 Integrated care pathways / protocols or Quality Circles in place with primary care	4 countries: BE; FR; NL; MT	2 countries: PT; DE	2 countries: BE; FR	3 countries: FR; NO; TR		BE - A financial incentive is foreseen on the one hand for local CMP meetings ("CMP projects") and on the other hand for quality promotion programs.

Pharmacy Services	Provided in most pharmacies under contract, agreement, regulation	Provided in some pharmacies as a pilot	Remunerated by Govn / Health Payer	Provided individually by some pharmacies	Regulatory limitations	Observations
39 High-Cost Therapy Dispensing and Management (e.g. Oncology, HIV, Rheumatoid Arthritis, Multiple Sclerosis)	19 countries: AT; BE; HR; FR; IT; NL; NO; FI; IE; LU; PL; SE; ES; UK; EL; TR; DE; HU; MT	2 countries: HR; PT	14 countries: BE; BG; HR; FR; IT; NL; NO; IE; PL; ES; UK; DE; HU; MT	5 countries: BG; IE; RS; CY; HU		IE - paid for by patients or Health Service if on the High-Tech scheme. CZ - This service is provided only in hospital pharmacies. SK - We do not have a definition of high-cost therapy. These drugs are routinely dispensed but dispensing and management are not defined. HU - paid for by patients and Health Service. MT - paid for by patients and/or National Health Service in private practice and Government by contract for National Health Service patients. DE - Regular medicines remuneration scheme. SE - paid for by patients or Health Service.
40 Drug dose titration (e.g. Insulin)	1 country: NL					
41 Galenic formulation	24 countries: AT; BE; DK; FR; IT; NL; MK; NO; CZ; FI; XK; LU; PL; PT; RO; SI; SE; ES; EL; SK; TR; DE; LV; MT		20 countries: BE; NL; MK; NO; CZ; FI; XK; LU; PL; PT; RO; SI; SE; ES; EL; SK; TR; DE; LV; MT	4 countries: BG; HR; IE; RS	1 country: SK	RS - paid for by patients. PT - the price is established by decree-law nr. 769/2004 and it includes a fee regarding preparation.
42 Other _____	3 countries: FR; NL; SI			7 countries: FR; IT; NO; FI; PL; TR; HU		
SERVICES BASED ON HEALTH TECHNOLOGY ASSESSMENT (HTA)						
43 Data collection on the effectiveness of new medicines				1 country: NL		SK - The pharmacy is obliged to report side effects to the State Institute for Drug Control.
44 Other _____	7 countries: AT; FR; NL; LU; PL; SE; SK	1 country: LU	1 country: FR	7 countries: CZ; PL; PT; UK; TR; EE; HU		

AT: Austria; BE: Belgium; BG: Bulgaria; CZ: Czech Republic; CY: Cyprus; DK: Denmark; DE: Germany; EE: Estonia; IE: Ireland; EL: Greece; ES: Spain; FI: Finland; FR: France; HR: Croatia; HU: Hungary; IT: Italy; LV: Latvia; LU: Luxembourg; MK: North Macedonia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; RS: Serbia; SE: Sweden; SI: Slovenia; SK: Slovakia; TR: Turkey; UK: United Kingdom; XK: Kosovo

UTI: Urinary Tract Infection; Hep: Hepatitis; COPD: Chronic Obstructive Pulmonary Disease; NOAC: Novel Oral Anticoagulants

Table 2. Current pharmacy services in Europe – country overview

	Country																																
Service	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	UK	XK	
DISPENSING SERVICES																																	
Night services																																	
Emergency supply of prescription-only medicines without prescription																																	
Urgent supply of prescription-only medicines without prescription																																	
Repeat dispensing																																	
Generic Substitution																																	
Refusal to dispense due to safety reasons																																	
Home delivery																																	
Other																																	
HEALTH PROMOTION SERVICES																																	
Handling and Disposal of Expired or Unwanted Medicines																																	
Needle/Syringe Exchange																																	
Pharmacy Travel Health																																	
Pharmacist-delivered vaccination																																	
Weight Management																																	
Smoking Cessation																																	
Health education																																	
Other																																	
Continues on the next page																																	

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(Continuation)	Country																															
Service	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	UK	XK
SCREENING AND REFERRAL SERVICES																																
Common Ailment Management Schemes																																
Screening individuals at-risk not on medication																																
Predictive medicine																																
Pharmacovigilance for medicines under additional monitoring																																
Scheduling visits / exams, delivery of reports																																
Referral to other healthcare providers																																
Other																																
DISEASE MANAGEMENT SERVICES																																
Administering injectable medicines																																
Directly observed treatment/ Supervised Consumption of Medicines																																
First time dispensing intervention																																
Instruction on use of therapeutic, self-monitoring device or medical aid																																
Therapeutic adherence support																																
Teleconsultations by pharmacists																																
Chronic disease management																																
Other																																
Continues on the next page																																

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(Continuation)	Country																															
Service	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	UK	XK
INDIVIDUAL CASE MANAGEMENT SERVICES																																
Dose Administration Aid																																
Medication Review																																
Home or Nursing Home Medication Review																																
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Deprescribing																																
Integrated care pathways / protocols or Quality Circles in place with primary care																																
High-Cost Therapy Dispensing and Management																																
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Galenic formulation																																
Other																																
SERVICES BASED ON HTA																																
Data collection on the effectiveness of new medicines																																
Other																																

AT: Austria; BE: Belgium; BG: Bulgaria; CZ: Czech Republic; CY: Cyprus; DK: Denmark; DE: Germany; EE: Estonia; IE: Ireland; EL: Greece; ES: Spain; FI: Finland; FR: France; HR: Croatia; HU: Hungary; IT: Italy; LV: Latvia; LU: Luxembourg; MK: North Macedonia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; RS: Serbia; SE: Sweden; SI: Slovenia; SK: Slovakia; TR: Turkey; UK: United Kingdom; XK: Kosovo

Provided in most pharmacies under contract, agreement, regulation
Provided in some pharmacies as a pilot

Provided individually by some pharmacies
Provided in some pharmacies as a pilot and individually by some pharmacies

3.1.2. Evidence on pharmacy services

Overviews of systematic reviews

We identified 4 umbrella reviews (overviews) of systematic reviews – 3 on the effectiveness, and 1 on the economic evaluation of community pharmacy services. This included 111 systematic reviews (including possible duplicates). We did not assess degree of overlap in systematic reviews across overviews.

Mossialos et al. reviewed 33 systematic reviews published between 2000 and 2012 evaluating the effectiveness of community pharmacists in achieving expanded roles. Systematic reviews addressed disease management (11), medication monitoring (11), medication adherence (8), smoking cessation, weight management and immunization (5), screening and referral (3), and appropriate use of medications (2). Some reviews covered more than one pharmacy service. Findings were positive in: disease management (cardiovascular risk, diabetes, hypertension, lipid management, asthma, adherence to antihypertensive medication, and prescribing for mental health conditions); screening and referral (symptom management and continuity of care); and smoking cessation. Mixed or inconclusive findings were found for: weight management; medication monitoring; adherence to antidepressant medications; clinical decision support systems on recommending additional or alternative medications for chronic conditions; and impact of collaboration between general practitioners and pharmacists. Most reviews were not exclusive of community pharmacy and included diverse populations, interventions, and outcomes [13].

Rotta et al. reviewed 49 systematic reviews published between 2000 and 2010 (containing 269 unique randomized controlled trials) evaluating the effectiveness of clinical pharmacy services on the medication use process and on patients' health outcomes. Reviews included community pharmacy but were not exclusive of this setting. Systematic reviews addressed appropriateness of medication (16) of which 7 in the elderly, medication adherence (14), disease management (13), smoking

cessation (2), and miscellaneous interventions (5). Findings were positive in disease management, e.g. hypertension and diabetes. Medication adherence presented mixed results, the most successful interventions included electronic devices, reminders, blister packs (dose administration aids) and regular scheduled consultations with the pharmacist at prescription refill dates. Mixed findings were observed regarding appropriateness of medication in the elderly due to the different criteria in defining polypharmacy. This also includes different instruments to measure appropriateness which do not allow for comparison. Also, most remaining reviews did not focus on the elderly and showed positive results. Mixed findings were also found in smoking cessation [18].

Thomson et al. reviewed 15 systematic reviews published until January 2018 (containing 157 primary studies) evaluating the effectiveness of community pharmacy public health interventions in health promotion and disease prevention, and in screening. This overview excluded, however, pharmacy interventions on medication adherence, medication management and disease management. The systematic reviews addressed: smoking cessation, weight management, alcohol misuse, needle exchange, and immunization (7); screening (6). Two reviews were having multicomponent interventions. Positive findings were found for smoking cessation, flu immunization, and needle exchange. Pharmacy increased flu vaccination rates among people who had missed vaccination the previous year or would not have received otherwise a vaccine. Evidence also showed that one third of the vaccines were administered outside working days highlighting the accessibility of the community pharmacies network.

Positive evidence was also found for screening and referral covering a wide spectrum of diseases including cardiovascular, osteoporosis, diabetes, depression, sleep disorders, respiratory diseases, cancers, and chlamydia. Although many studies were not able to demonstrate confirming of early diagnosis by physicians [19].

Costa et al. reviewed 14 systematic reviews published until July 2017 (containing 75 primary studies) on the economic evaluation of community pharmacy public health interventions. Although this overview focused on methods, it included some findings. Nearly 44% of primary studies on the economic evaluation of pharmacy services were conducted in Europe. Primary studies included in systematic reviews addressed: diabetes, hypertension, hyperlipidemia, asthma and smoking cessation (40); medication management (13); high cost / case management, especially for the elderly on multiple medication (10 studies); adherence in new-to-therapy (5); screening (4); and immunization (2). Overall reviews reported favorable economic findings for 71% of studies with full economic evaluations, cost-consequence, or cost-minimization analysis [10].

Although overviews are quite different between one another and have different objectives, disease management, screening and referral, and smoking cessation seem very consistent in positive trend emerging from systematic reviews assessed by these overviews.

Degree of overlap in primary studies using CCA was reported for Costa et al. (4.4%) indicating just a slight degree of overlap.

Table 3 presents a summary of findings of overviews.

Table 3. Summary of findings of included overviews

First author (year) [REF]	Search period	Objective	No. included systematic reviews (n)	Interventions + trend	Interventions +/- trend
Mossialos (2013) [13]	2000-2012	Effectiveness	33	Disease management (cardiovascular risk, diabetes, hypertension, lipid management, asthma, adherence to antihypertensive medication, prescribing for mental health) Screening and referral Smoking cessation	Weight management Medication monitoring Adherence antidepressants Clinical decision support systems on medications for chronic conditions Impact of collaboration GPs and pharmacists
Rotta (2015) [18]	2000-2010	Effectiveness	49 (~ 269 RCT)	Disease management (e.g hypertension and diabetes) Medication review not on the elderly	Medication adherence Appropriate medication in the elderly Smoking cessation
Thomson (2019) [19]	Until Jan 2018	Effectiveness in health promotion, disease prevention, screening OBS: Medication and disease management excluded	15 (~ 157 primary studies)	Smoking cessation Flu immunization Needle exchange Screening and referral (cardiovascular, osteoporosis, diabetes, depression, sleep disorders, respiratory diseases, some cancers, chlamydia)	<i>In screening, many studies not able to demonstrate confirming of early diagnosis by physicians.</i>
Costa (2019) [10]	Until July 2017	Economic evaluation OBS: Focusing on methods	14 (~ 75 primary studies)	In 71% of studies with full economic evaluations, cost-consequence, or cost-minimization analysis	In remaining 29%.

+: Positive; +/-: Mixed or unclear; OBS: Observation; RCT: Randomized Controlled Trial; GP: General Practitioner

Systematic reviews

Description of included systematic reviews

Our search identified 38 systematic reviews containing 242 included publications (including overlapping) corresponding to 149 unique primary studies meeting the inclusion criteria. A Corrected Covered Area (CCA) value of 2% was obtained, indicating a minimal degree of overlap of primary studies in systematic reviews.

Search dates of systematic reviews varied from inception to March 2020.

The reviews were published in 28 different journals: 11 in disease / medical journals; 9 in pharmacy journals; 4 in health economics journals; 3 in health policy journals; and 1 in epidemiology journal.

With a few exceptions, most systematic reviews tend to include studies addressing diverse settings, populations, interventions, outcomes, and study designs.

Only 2 reviews focused exclusively on the community pharmacy setting [20][21]. The included primary studies were, on average, 33% of all studies included in systematic reviews.

These systematic reviews address interventions provided in European community pharmacies covering more than 25 different health conditions or risks, namely: diabetes; polypharmacy and/or elderly; hyperlipidemia; hypertension; asthma and chronic obstructive pulmonary disease (COPD); depression; common / minor ailments (covering more than 40 minor conditions); smoking, overweight / obesity and/or alcohol disorder; coronary heart disease (CHD); heart failure (HF) and myocardial infarction (MI); chronic pain, headache and migraine; dementia in institutionalized patients; osteoporosis; sleep disorder; metabolic syndrome; HIV; cancer (prostate, colorectal, cervix); Parkinson's disease; etc.

Disease management and individual case management services represented most interventions addressed in systematic reviews, followed by screening and referral services. A few reviews described health promotion and disease prevention

services. We did not find reviews including primary studies addressing dispensing related services.

Twenty-one systematic reviews reported including studies with a comparator, 10 reviews did not report on comparator, and 9 reviews reported no comparator in included studies.

Outcomes are very diverse, across and within interventions, and include metrics captured at the pharmacy either through patient measurements or patient reported outcomes using validated health scales or surveys, or through electronic data capturing, such as: surrogate clinical outcomes (e.g. blood pressure, blood glucose, lipids, weight, cardiovascular risk assessment; diabetes risk assessment, asthma control test, minor ailment assessment, quit rates, etc); health services utilization and economic outcomes (emergency room visits, hospital admissions, costs, costs and outcomes, cost-effectiveness, cost-utility, etc); and humanistic outcomes (quality-of-life, health status, disease symptoms, satisfaction, etc). Process indicators were also frequently reported, including: medication adherence; drug-related problems; adverse events; etc.

Twenty-one reviews included randomized controlled trials (RCTs and cluster RCTs), nonrandomized controlled trials (NRCT), and repeated measures (RM). Nineteen reviews included economic studies (EE) of which 10 are including economic evaluation studies only.

Table 4 summarizes the characteristics of included systematic reviews.

Table 4. Characteristics of included systematic reviews

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
McDerby, 2020 [22]	Until Nov 2018	To evaluate outcomes associated with pharmacist-led medication reviews in residential aged care facility residents with dementia.	3 (50%)	Denmark; Netherlands; UK	Residential aged care facility residents with dementia	Medication review by community pharmacist for residents with dementia and pain	No	Pain intensity scores; Number of pharmacist recommendations; Recommendation acceptance rate by GPs	2 Non EPOC, 1 RCTs
Reeves, 2020 [23]	1 Jan 1995 to 31 Jan 2018	To review reports of RCTs on the effectiveness of pharmacists' intervention to improve BP control and medication adherence in patients with hypertension.	2 (6%)	Portugal; Spain	Adult patients with Type 2 diabetes; adults with hypertension treated for less than 6 months	Chronic disease management (hypertension)	Yes	BP	2 RCTs
Sanyal, 2019 [24]	Until 5 Feb 2019	To conduct a systematic review of cost-utility studies of community-based services provided by pharmacists and to examine reporting and methodological quality.	12 (60%)	Belgium; France; Italy; Netherlands; Spain; UK	Patients with polypharmacy or chronic diseases (respiratory disease, depression, osteoporosis), smokers or patients on lipid-lowering therapy	Medication review, chronic disease management in primary care, smoking cessation, reducing medication errors, screening	Yes, some usual care	Almost all ICER (2 exceptions: QALYs and QALDs)	12 EE
Sanyal, 2020 [25]	Until Feb 2019	To review the reporting and methodological quality of full economic evaluations of services provided by community pharmacists.	9 (45%)	Netherlands; UK	Elderly patients at high risk of potentially serious medication errors, patients with depression, smokers, chronic conditions	Chronic disease management, medication review, smoking cessation, medication management	Yes, usual care	ICER; costs; costs/life-year; cost-savings; life-years gained; adherence; hospital admissions	9 EE
Dann-Reed, 2020 [26]	1974 to Jul 2016	To identify, describe, and evaluate the quality of the research for dementia-specific pharmacy-based interventions with potential for delivery through community pharmacy.	2 (7%)	UK	People with dementia	Chronic disease management	Not reported	Not reported	2 Non EPOC

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Gudi, 2019 [27]	1 Jan 2008 to 31 Dec 2018	To address the impact of pharmacist-led home medicines review services on identifying drug-related problems among the elderly population in home care.	1 (10%)	Germany	Elderly population (not institutionalized)	Medication review (inappropriate medicines, drug-drug interactions)	No comparator	Drug-drug interactions (DDIs)	1 Non EPOC
Anthony, 2019 [28]	Not reported	To review economic evaluations of nurses, pharmacists, and other allied health professionals in primary care as substitutes for some of the tasks performed by GPs.	1 (17%)	UK	Patients consulting in primary care with coronary heart disease	Medication management	Yes, usual care from GP	Appropriate treatment; SF-36 and EQ-5D; total NHS costs; intervention direct costs and NHS treatment costs; indirect costs of training.	1 EE
Buss, 2018 [29]	Until Nov 2017	To evaluate the effectiveness and analytical quality of point-of-care tests performed in the community pharmacy.	1 (9%)	Spain	Not reported	Point-of-care testing (HIV)	Yes, regional surveillance for new HIV diagnoses	Test result	1 NRCT
Singh, 2018 [30]	2000 to 2018	To synthesize the available empirical evidence regarding pharmacy health coaching and to define it.	4 (40%)	Denmark; Netherlands	Patients with hypertension or depression	Health coaching	Not reported	Health outcomes; cost-effectiveness; drug attitude; medication management/adherence; relationship between professionals	1 EE, 2 RCTs, 1 Non EPOC
Crespo-Gonzalez, 2018 [31]	Not reported. Search in Dec 2016	To analyze the intervention dose, and core components of the intervention provided by pharmacists in asthma management.	9 (29%)	Belgium; Bulgaria; Denmark; Finland; France; Germany; Malta; Spain	Asthma patients	Chronic disease management; counseling sessions on disease, medication, symptoms, adherence, triggers, inhaler technique; Peak Flow Meter, referral to GP	Not reported	Number of patients referred; duration and frequency of intervention; number of patients receiving the intervention, etc	1 Non EPOC, 1 RM, 5 RCTs, 2 NRCT

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Deters, 2018 [32]	Jan 2000 to Feb (PubMed) / Apr (Cochrane) 2016	To evaluate randomized controlled trials that included interventions provided by community pharmacists for patients with type 1 and 2 diabetes.	3 (27%)	Belgium; Spain; UK	Type 2 diabetes patients	Medication therapy management	Not reported	HbA1c; BG; BP; lipid profile; weight; diabetes knowledge; health status; patients' satisfaction; medication beliefs; drug-related outcomes; adherence	3 RCTs
Teljeur, 2017 [33]	Until 4 Mar 2015	To review the evidence on the costs and cost-effectiveness of self-management support interventions for people with diabetes.	1 (3%)	Bulgaria	Patients with type 2 diabetes	Chronic disease management; educational programme	No	BG; QoL; costs	1 EE
Mohammed, 2016 [34]	2005 to Sept 2015	To evaluate the impact of pharmaceutical care interventions on health-related quality of life.	7 (15%)	Belgium; Germany; Spain; UK	Chronic disease (headache, migraine, Parkinson's disease, asthma, stroke, diabetes, COPD, depression)	Pharmaceutical care	Yes	HRQoL (generic and disease-specific)	3 NRCT, 4 RCTs
McCullough, 2016 [35]	Until Mar 2015	To describe behavioral change theories used in adherence interventions in adults with chronic respiratory disease, content, provider, delivery, setting, frequency and duration.	2 (4%)	Belgium	Adults with COPD with daily maintenance medication in community setting	Education and monitoring: leaflets, demonstration inhalers, nonadherence, COPD medication, self-management, smoking cessation.	Yes	Adherence (medication possession ratio)	2 RCTs
Sabater-Hernández, 2016 [36]	Until 30 Nov 2014	To identify community pharmacy evidence-based services designed to help prevent CVD.	11 (69%)	Belgium; Netherlands; Portugal; Spain; Sweden; UK	Patients with cardiovascular risk factors (type 2 diabetes, hypertension, dyslipidaemia, overweight/obese, smokers), HF or MI	Prevention of CVD: activities directed at patients, at health care professionals, and assessments to support the previous activities	Yes	BP; BG; HbA1c; hypo- and hyperglycemic episodes; TC; TG; HDL-C; LDL-C; BMI; albumin-creatinine ratio; CV risk; health status; adverse drug reactions; drug-related problems. Process, patient behaviors (incl. adherence), determinants of behaviors assessed.	11 RCTs

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Brown, 2016 [37]	Until May 2014	To review the effectiveness of community pharmacy-delivered interventions for alcohol reduction, smoking cessation and weight management.	9 (39%)	Netherlands; UK	Adults with alcohol use disorders, smokers or overweight	Brief alcohol advice; smoking cessation intervention 12 weeks; smoking cessation advice; computer-generated tailored advice to aid smoking cessation; "My Choice Weight management programme".	Yes, usual care or group-based intervention	AUDIT scores, % harmful drinkers; consumption, problems and dependence; EQ-5D; FAST score; number of alcohol-free days per week; barriers/ facilitators; CO-validated quit rates; self-reported quits (or abstinence or point prevalence); cessation aids; pharmacy staff perceptions; weight; BMI; waist circumference; physical activity; SF-12; costs; cost-effectiveness; cost-utility	5 EE, 4 RCTs
Lindsey, 2015 [38]	Until Jun 2015	To review the literature to identify and assess the current evidence for the role of community pharmacies in delivering early cancer detection initiatives.	4 (33%)	Germany; Italy; Spain	Patients at-risk for cancer (prostate, colorectal, cervix)	Screening (cancer)	Yes, some	Increasing awareness and knowledge; referral; influencing patient's behavior; outcomes (FOB/FIT, PSA, Pap/HPV DNA); health outcomes (cancer diagnosis). Number of positive test results, detection rate, acceptance, participation	3 CS, 1 RCTs
Antoine, 2014 [39]	Not reported. Search in March 2013	To analyze the effectiveness of adherence-enhancing pharmacist interventions for oral medication in type 2 diabetes mellitus.	1 (17%)	Belgium	Type 2 diabetes patients	Chronic disease management (education & reminders for annual eye and foot examinations (baseline, at refill, for 6 months)	Yes, usual care	Prescription refill rate & self-reported adherence	1 RCTs
Bolen, 2014 [40]	Until Nov 2011	To evaluate the effectiveness and safety of interventions for adults with type 2 diabetes.	2 (1%)	Spain; Sweden	Type 2 diabetes patients	Chronic disease management	Yes, usual care	Changes in: HbA1c; systolic BP; body weight; lipids	2 RCTs
Fathima, 2013 [41]	Jan 2003 to Mar 2013	To evaluate the role of community pharmacists in provision of screening with/without management of undiagnosed COPD and uncontrolled asthma.	9 (53%)	Belgium; France; Portugal; Spain; UK	Not reported	Screening of disease control/risk factors in asthma and COPD; chronic disease management	Not reported	Asthma control; patients' perception; controller medication and physician visits; knowledge and attitudes; inhaler technique; adherence; asthma exacerbation; asthma QoL; patients at high risk of COPD	5 CS, 2 RCTs, 2 Non EPOC

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Paudyal, 2013 [20]	2001 to 2011	To explore the effect of pharmacy-based minor ailment schemes on patient health- and cost-related outcomes; and impact on general practices.	31 (100%)	UK	Not reported	Minor ailment schemes (wide range of conditions (>40), most frequent: head lice, diarrhoea, constipation, Vaginal candidiasis)	Not reported	% patients with improvement following consultation; types of minor ailments in reconsultation or referral; impact on GP costs for minor ailments; no. GP or nurse consultations for minor ailments in same area as pharmacies; no. medicines supplied for minor ailments; patient and stakeholder perspectives / satisfaction	6 CS, 1 Non EPOC, 24 EE
Ayorinde, 2013 [42]	Jan 1990 to Aug 2012	To assess the evidence about the feasibility and acceptability of community pharmacy-based screening for major diseases.	11 (22%)	Ireland; Spain; Switzerland ; UK	General public or patients at risk	Screening: CV disease (high BP, high TC, 10-year risk of CV disease, diabetes (incl. high BG), sleep disorder, COPD (incl. spirometry), osteoporosis (incl. bone mineral density), smoking.	No	% of participants at risk; referrals to other healthcare providers; accuracy of screening tests; awareness of disease; perceptions including satisfaction; economic outcomes	11 CS
Gudka, 2013 [43]	Until 30 Oct 2011	To determine types of pharmacy-based chlamydia screening interventions, uptake rates, acceptability issues, and barriers.	7 (58%)	Netherlands; UK	Clients requesting a test or when dispensing emergency contraception	Screening for chlamydia	No	Uptake of screening; acceptability or barriers to screening	5 CS, 1 Non EPOC, 1 EE
Kapadia, 2013 [44]	1 Jan 1995 to 30 Jun 2011	To estimate the prevalence of Chlamydia infection among those screened in community pharmacies.	8 (73%)	Netherlands; UK	Clients requesting a test or when dispensing emergency contraception	Screening for chlamydia	No	Test kit acceptance rate or return rate	7 CS, 1 EE
Brown, 2019 [45]	Until Dec 2018 (CCMD-CTR to Jun 2016)	To examine the effects of pharmacy-based management interventions compared with active control, waiting list, or treatment as usual at improving depression outcomes in adults.	2 (17%)	Netherlands; Spain	Adult patients with depression beginning treatment	Patient education on disease and medication use; medical and pharmaceutical care plus support programme; patient education and adherence	Yes, usual care from pharmacist or physician	Medication adherence; self-rated mental health; drug attitude; attrition (acceptability); cost-effectiveness; clinical severity (PQ-9); anxiety (STAI-S); EQ-5D; satisfaction; adverse effects	2 RCTs
van Driel, 2016 [46]	Until Feb (databases) and Jul	To assess the effects of interventions aimed at improving adherence to lipid-lowering drugs,	3 (9%)	Belgium; Netherlands	Patients average age 60; and new users of statins age 18 and above	5 counselling sessions on adherence, benefits of statin use with electronic	Yes, usual care	Adherence (time to discontinuation, medication possession ratio); lipid levels; persistence	3 RCTs

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
	(registries) 2016	focusing on adherence and clinical outcomes.				reminder; review of dosing history using reminders			
Hatah, 2014 [47]	Until Feb 2011	To examine the impact of fee-for-service pharmacist-led medication review on patient outcomes and quantify this according to the type of review undertaken.	12 (38%)	Belgium; Denmark; Germany; Malta; Netherlands; UK	Elderly or chronic disease patients (asthma, CHD, HF on loop diuretics, dyslipidaemia on atorvastatin), previous transient ischaemic attack or ischaemic stroke, or discharged from hospital	Medication reviews: clinical medication reviews; adherence reviews; other type of review	Not reported	Disease control (asthma control/severity), self-reported symptoms, hospitalization, mortality; adherence, medication and medical costs, healthcare resource use, QoL	3 EE, 8 RCTs, 1 NRCT
Altowaijri, 2013 [48]	Until Feb 2011	To perform a systematic review assessing the effectiveness of clinical pharmacist interventions within a multidisciplinary team in the secondary prevention of CVD.	10 (19%)	Netherlands; Spain; Sweden; UK	Patients with heart failure, CHD, or with CV risk factors	Medication management; educational intervention	Yes, usual care/no intervention	CVD; CVD risk factors (diabetes control, smoking cessation, blood pressure control, lipid control); adherence; knowledge; satisfaction; quality-of-life; drug-related problems; hospitalization, ER visits, costs	5 RCTs, 5 EE
Cai, 2013 [49]	Until Jul 2012 (updated in Sept 2013)	To evaluate the role of pharmacist care on mortality, morbidity, and the CHD management.	1 (20%)	UK	CHD patients; patients on: aspirin, lipid-lowering drug, β -blocker, or ACE inhibitor	MEDMAN (medicines management)	Yes, usual care	Adherence and BP control	1 EE
Hadi, 2014 [50]	Until Jun 2012 (for most databases)	To evaluate the effectiveness of pharmacist-led medication review in chronic pain management.	1 (20%)	Germany	Patients with chronic pain (headache and migraine) age ≥ 18 years	Face-to-face medication review plus advice on pacing activities and goal setting	Yes, usual care with no training	Pain intensity; physical functioning (subscale of SF-36); QoL (SF-36)	1 RCTs
Al Adawi, 2020 [51]	Jan 2008 to Mar 2020	To review the evidence on pharmacists' input to the screening, prevention, and management of metabolic syndrome.	1 (10%)	Spain	Adult patients screened for metabolic syndrome risk factors.	Screening for pre-metabolic syndrome and cardiovascular risk factors	No	Prevalence of MetS, presence of CV risk and factor; facilitators and barriers of effective implementation	1 CS

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Wang, 2016 [52]	Jan 2006 to Dec 2014	To review and evaluate the most recent literature on the economic outcomes of pharmacist-managed services in people with diabetes.	1 (4%)	Bulgaria	Type 2 diabetes with no severe complications, on monotherapy, no insulin	Five education sessions on: type 2 diabetes and self-monitoring; effect of obesity on insulin sensitivity and advantages of weight reduction; foot care; diabetes-related eye diseases; possible adverse drug reactions	Yes, historical self-control (usual care primary care)	Economic	1 EE
Peletidi, 2016 [53]	1990 to 2014	To evaluate the evidence on training, interventions, outcomes, and cost-effectiveness of pharmacy-led smoking cessation services within the UK.	5 (83%)	UK	Smokers	One-to-one counselling; smoking programs	Yes, group therapy or as control	Cessation rates; training; cost per participant; cost-effectiveness	2 EE, 3 RCTs
Perraudin, 2016 [21]	From 1 Jan 2004	To synthesize cost-effectiveness analyses on professional pharmacy services in Europe in order to contribute to current debates on their funding and reimbursement.	21 (100%)	Belgium; Denmark; France; Netherlands; Spain; UK	Patients: at risk of serious medication errors; with minor illness; elderly with polypharmacy; COPD; initiating lipid-lowering therapy; with chronic pain; prescribed new antidepressant; with CHD; smokers; at risk for sleep apnea; young women requesting contraceptive	Interventions to: enhance medicine safety and access to medicines; improve outcomes; improve public health. No studies on interventions to improve the efficiency and quality of the health system.	Yes, usual care/feedback to the GP/self-quit scenario	Effectiveness and economic outcomes	21 EE
Loh, 2016 [54]	Until 31 Aug 2015	To evaluate the effects of medication review on health-related quality-of-life and healthcare costs in the elderly.	7 (28%)	Belgium; Multiple countries; Netherlands; Spain; UK	Community dwelling patients with specific disease states and participants with non-specific conditions	Medication review, patient-directed education addressing drug-related problems, subsequent follow-up	Not reported	Economic and humanistic (e.g HRQoL)	4 EE, 3 RCTs
Malet-Larrea, 2016 [55]	Until Sept 2015	To determine cost-effectiveness of professional pharmacy services to patients attending community pharmacies.	9 (39%)	Belgium; Multiple countries; Netherlands; Spain; UK	Not systematically reported	Pharmacy face-to-face interaction (and telephone-based intervention in one study).	Yes, usual care	Costs and outcomes; ICER	9 EE

First author, Year [REF]	Search period	Objective (short)	No. (%) incl. studies	Countries of origin	Populations	Pharmacy-based or -led Interventions	Comparators	Outcomes	Study designs
Gammie, 2017 [56]	2010 to 2015	To review the literature on methods of economic evaluations of hospital and community pharmacy services in publicly funded health systems, clinical outcomes, and economic effectiveness.	7 (50%)	France; Spain; UK	Not reported	Medication or disease-specific education to patients and GPs, medication management programs, review of physician-implemented medicine plans, or follow-up support to patients.	Not reported	Improvements in patient health outcomes; reductions in nonscheduled GP visits, ER visits, hospital bed days, medication errors, and adverse events; and increases in HRQoL.	7 EE
Elliott, 2014 [57]	2003 to 2013	To set out the methodological strengths, weaknesses and challenges associated with analysing the cost effectiveness of pharmacist interventions.	12 (39%)	Netherlands; UK	Patients with chronic disease (CV disease, asthma, depression, HIV 1), smokers, elderly, with minor ailments; chlamydia screening participants	Interventions focusing on supporting the prescribing of medicines; use of medicines; screening and education programs and a combination of all.	Not reported	Economic	12 EE

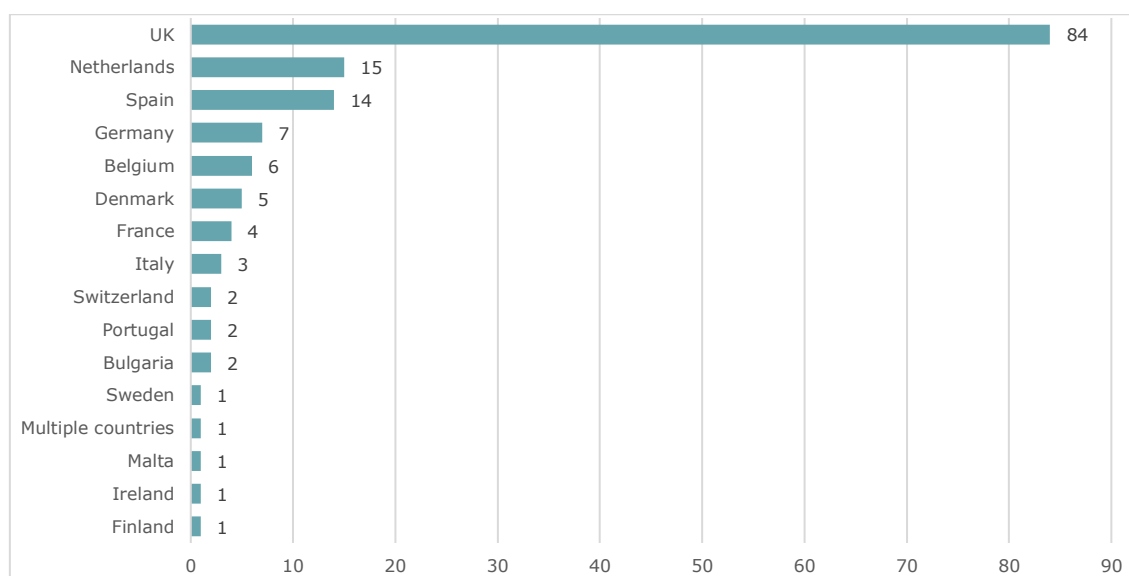
CS: Cross-sectional study; EE: Economic Evaluation; Non EPOC: NON EPOC; NRCT; Non-randomized trial; RCT: Randomized trial; RM: Repeated Measures

Description of European community pharmacy primary studies reported in systematic reviews

Nearly 56% of primary studies in community pharmacy (CP) in Europe covered in systematic reviews were from the UK, 10% from the Netherlands, 9% from Spain, 5% from Germany, 4% from Belgium, 3% from Denmark, and 2.7% from France. These 7 countries have around 90% of research in Europe on community pharmacy interventions. These primary studies were included in systematic reviews.

Figure 1 illustrates countries of research origin of community pharmacy studies in Europe.

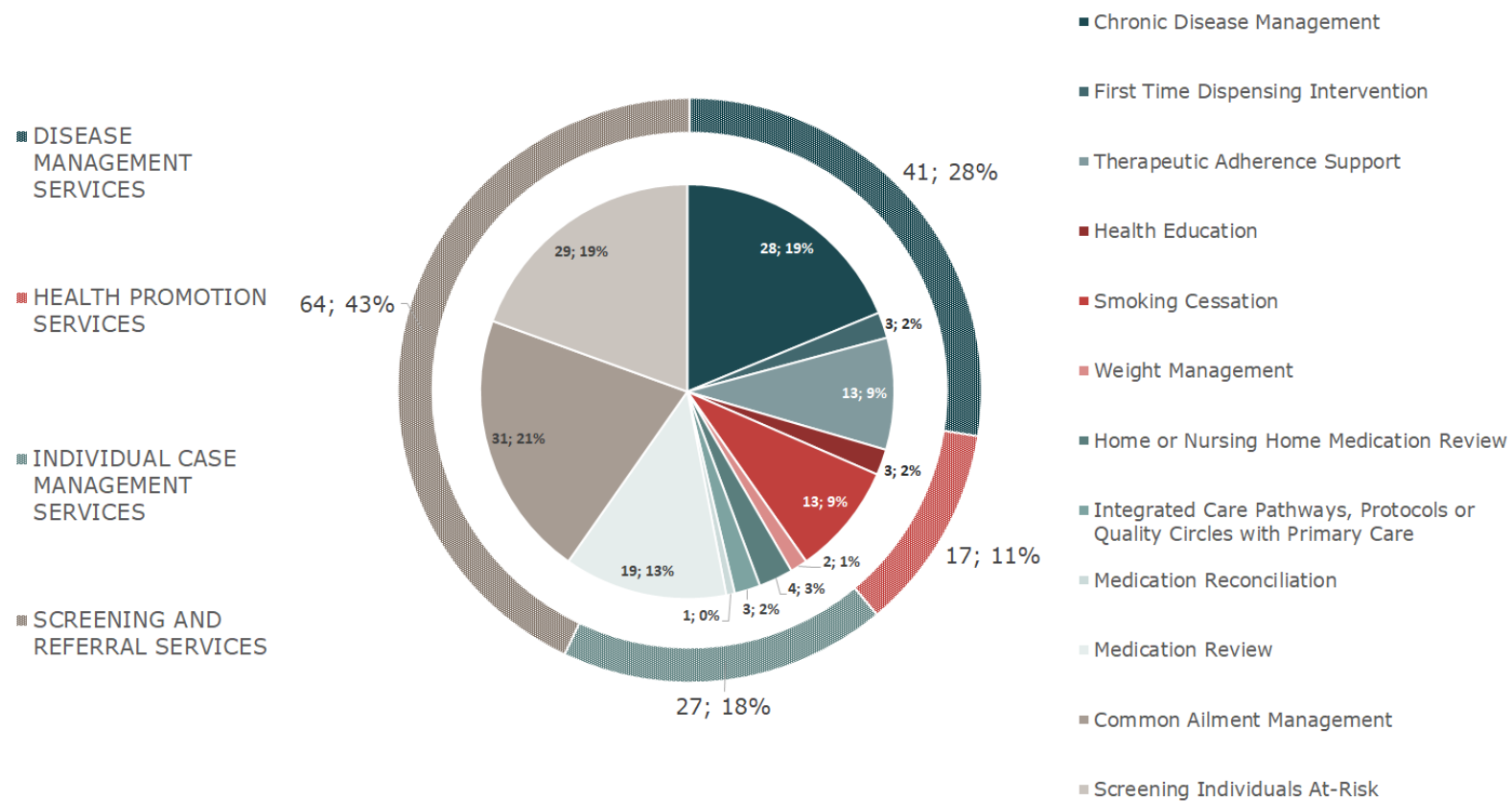
Fig. 1. No. community pharmacy (CP) primary studies in Europe per country of research origin



Screening and referral services were the most frequent intervention category in primary studies in Europe included in reviews (64 studies, 43%), followed by disease management services (41 studies, 28%), individual case management services (27 studies, 18%), and health promotion services (11%).

Figure 2 illustrates the number and type of CP primary studies in Europe. This is per intervention category and per service.

Fig. 2. No. CP primary studies in Europe per intervention



The top 6 researched pharmacy-based interventions represent 89% of the primary studies in Europe. This includes: screening at-risk individuals (22% of primary studies); common / minor ailment screening and treatment (21%); chronic disease management (17%); medication review and medication therapy management (13%); therapeutic adherence support (9%); and smoking cessation (8%).

Integrated care pathways with primary care, medication reconciliation, and first-time dispensing already appeared in few studies included in the systematic reviews.

It was observed that the chronic disease management and screening at-risk individuals were the two interventions in primary studies conducted across a wide number of countries.

Table 5 provides an overview of country of research origin per intervention.

Table 5. Country of research origin of interventions in CP primary studies in Europe

Intervention	BE	BG	DK	FI	FR	DE	IE	IT	MT	NL	PT	ES	SE	CH	UK	Mult*	Grand Total	CP primary studies included (REFs)
HEALTH PROMOTION SERVICES			1							1	1				14		17	
Health education											1				2		3	[58–60]
Smoking Cessation			1							1					10		12	[61–72]
Weight Management															2		2	[73,74]
SCREENING AND REFERRAL SERVICES	1				2	1	1	2		1	1	5		2	48		64	
Common / Minor Ailment Management															31		31	[75–105]
Screening Individuals At-Risk	1				2	1	1	2		1	1	5		2	17		33	[106–138]
DISEASE MANAGEMENT SERVICES	4	2	3	1	2	2			1	8		7	1		10		41	
Chronic disease management	3	2	1	1	2	2			1	1		5	1		6		25	[139–163]
First Time Dispensing Intervention												1			2		3	[164–166]
Therapeutic adherence support	1		2							7		1			2		13	[166–178]
INDIVIDUAL CASE MANAGEMENT SERVICES	1		1			4		1		5		2			12	1	27	
Home or Nursing Home Medication Review			1							1					2		4	[179–182]
Integrated Care Pathways, Protocols or Quality Circles with Primary Care															3		3	[183–185]
Medication Reconciliation										1							1	[186]
Medication Review and Medication Therapy Management	1					4		1		3		2			7	1	19	[187–204]
Total	6	2	5	1	4	7	1	3	1	15	2	14	1	2	84	1	149	

BE: Belgium; BG: Bulgaria; DK: Denmark; FI: Finland; FR: France; DE: Germany; IE: Ireland; IT: Italy; MT: Malta; NL: The Netherlands; PT: Portugal; ES: Spain; SE: Sweden; CH: Switzerland; UK: United Kingdom; * Multiple countries: DH, DE, NL, UK, PT, IE, SE

CP: Community Pharmacy

Primary studies comprise 149 studies of which 85 studies addressing effectiveness or impact and 64 economic evaluations. Of 85 studies, 36 are randomized controlled trials (RCTs), 5 non-randomized trials (NRCTs), 1 repeated measures, 33 cross-sectional studies, and 10 other non-EPOC design (before-after and cohort studies). Of 64 economic evaluations, 59 obtained effectiveness estimates from studies that adopted an EPOC design.

Sixty-nine (46.3%) studies present a positive trend (effectiveness, impact, patient reported outcomes, economic outcomes, etc), 27 (18.1%) studies have mixed or inconclusive results, 6 (4%) have a negative trend, and trend is not reported in 8 (5.4%) studies. Some of these studies with no reported trend are cross-sectional (e.g. screening) where outcome of screening could not be captured. Twenty-four primary studies included in systematic reviews, mostly derived from grey literature on minor ailments, could not be found in electronic search.

Twenty-seven economic evaluations of 59 (46%) presented a positive trend, 10 (17%) are mixed or unclear, and 4 (7%) are negative. In further 18 studies (30%) the economic trend is not available because they derive from grey literature on minor ailments which could not be found in electronic search.

Screening at-risk individuals, chronic disease management, medication review, therapeutic adherence support and smoking cessation present a high proportion of positive trend on total studies within the intervention.

Table 6 provides an overview of direction of findings per pharmacy service.

Table 6. Characteristics of interventions in primary studies in community pharmacy in Europe

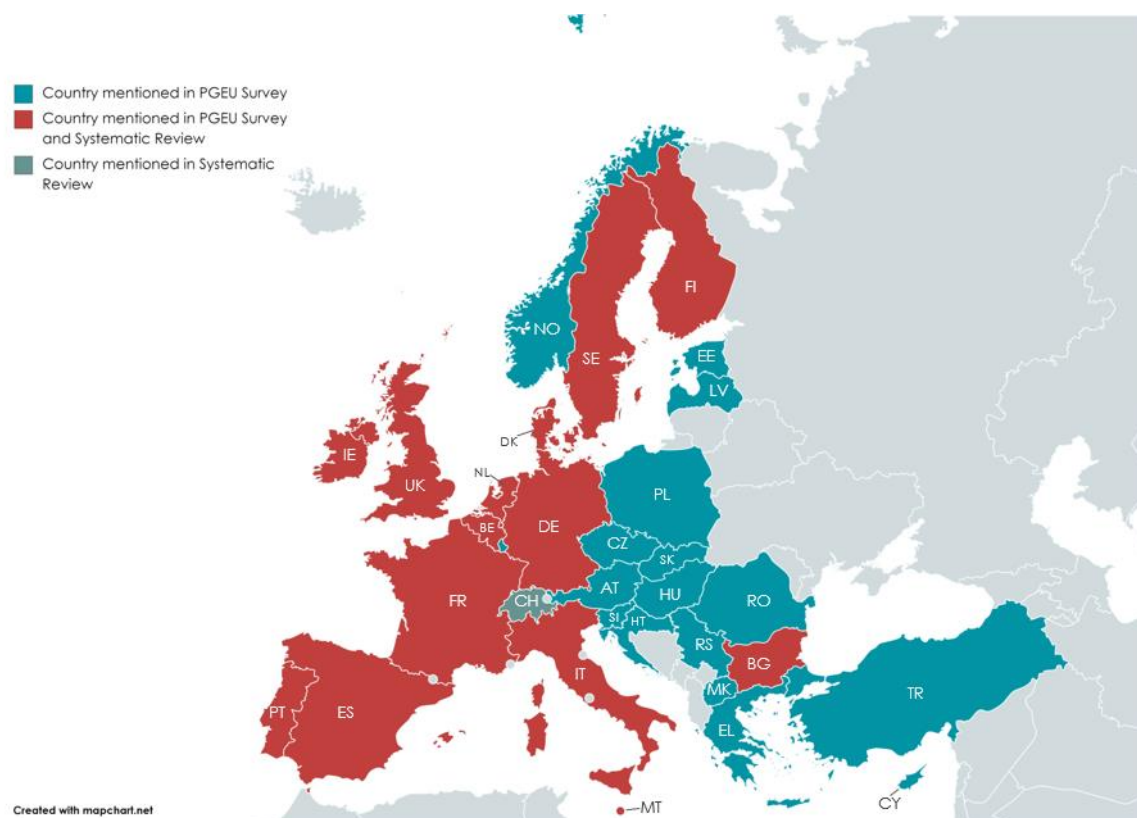
Interventions	CP primary studies (n)	Direction of findings						OBS	CP primary studies included (REFs)
		Pos	Mix	Neg	NE	NA	NR		
HEALTH PROMOTION SERVICES									
Health education	3	1	2						[58–60]
Smoking Cessation	12	10	2						[61–72]
Weight Management	2		2						[73,74]
SCREENING AND REFERRAL SERVICES									
Common/Minor Ailment Management	31	4	1		5	21		Several primary studies reported in grey literature referenced in SR but no longer available	[75–105]
Screening Individuals At-Risk	33	19	3		1	2	8	Not reported likely due to no referral information or no confirmation of diagnosis	[106–138]
DISEASE MANAGEMENT SERVICES									
Chronic disease management	25	13	4	3	4	1			[139–163]
First Time Dispensing Intervention	3	2	1						[164–166]
Therapeutic adherence support	13	8	3	1	1				[166–178]
INDIVIDUAL CASE MANAGEMENT SERVICES									
Home or Nursing Home Medication Review	4	1	1		2				[179–182]
Integrated Care Pathways / protocols or Quality Circles in place with primary care	3	1	1		1				[183–185]
Medication Reconciliation	1		1						[186]
Medication Review	19	10	6	2	1				[187–204]
Total	149	69	27	6	15	24	8		

CP: Community Pharmacy; Pos: Positive; Mix: Mixed or unclear; Neg: Negative; NE: Non-EPOC; NA: Not Available; NR: Not Reported; OBS: Observations; SR: Systematic Review

While mapping current practices of pharmacy services reflects replies from 32 countries in Europe, however it is important to note that the available evidence on some of these services came from studies conducted in 15 countries in Europe.

Figure 3 illustrates the contribution of country research described in primary studies included in systematic reviews.

Fig. 3. Map of countries with research vs. practices of pharmacy services in primary studies of systematic reviews



3.2. Part 2 – Pharmacy interventions on COVID-19

3.2.1. Mapping of current pharmacy interventions on COVID-19

We have received replies to Country Survey Part 2: Pharmacy Interventions on COVID-19 from 32 PGEU member countries.

The most common pharmacy measures and interventions on COVID-19 in place in all 32 European countries were: patient information and education on preventive measures; queue management in pharmacies; floor marking inside pharmacies; and barriers at counters in pharmacies.

The second tier was in place in 26-31 countries. This included: protocols for disinfection of surfaces; use of masks by staff; stock and supply of hand sanitizers; stock and supply of protective masks; symptom-based referral pathways for suspected cases; increased demand / changes to home delivery of medicines; and reestablishing patient care services and stock levels.

The third tier was in place in 14-25 countries and included: stock and supply of essential medicines; dealing with the supply of medicines shortages; preparing alcohol-based hand sanitizer formulations; and pharmacy telephone support to vulnerable patients during isolation / lockdown.

The fourth tier was in place in 6-13 countries: 1st and 2nd line pharmacy staff; quantity limits dispensed; increased demand / changes to repeat dispensing; emergency supply of medicines, supply of medicines usually supplied in the hospital setting; hotline numbers for home delivery of medicines; and protocol for pharmacies for reporting on domestic violence during isolation / lockdown.

The least frequent interventions on COVID-19 (practiced in less than 6 countries) include: use of other Personal Protective Equipment (PPE) by staff; restriction in opening hours; temporary suspension of patient care services; point-of-care antigen test-based referral pathways for suspected cases; temporary waived prescription copayments for vulnerable patients; drive thru pharmacy services;

and referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19.

Seventeen interventions had expanded powers granted to pharmacists in 16 countries including: increased demand / changes to repeat dispensing; dealing with the supply of medicines shortages; supply of medicines usually supplied in hospital; preparing alcohol-based hand sanitizers; protocol for pharmacies for reporting on domestic violence during isolation / lockdown; temporary waived prescription copayments for vulnerable patients; use of masks by staff; stock and supply of essential medicines; point-of-care antigen test-based referral pathways for suspected cases; emergency supply of medications; increased demand / changes to home delivery of medicines; pharmacy telephone support to vulnerable patients during isolation / lockdown; dealing with new vulnerable patients and referral pathways of exposed patients to antibody testing.

Twenty countries passed legislation in view of COVID-19 for 23 interventions, including: stock and supply of hand sanitizers; preparing alcohol hand sanitizers; increased demand / changes to repeat dispensing; stock and supply of essential medicines; supply of medicines usually supplied in hospital, just to mention the most frequent.

At the time of reply (September 2020) emergency temporary closures of pharmacies had occurred in Germany (30 pharmacies), Spain (20), Sweden (10-20), Portugal (15), Croatia, Luxembourg, and Poland (2), Belgium (1). Czech Republic, Ireland, Norway, and Greece also reported temporary closures of pharmacies. These figures may have increased or changed.

Deaths of pharmacy staff due to COVID-19 were reported to have occurred in Spain (19), Turkey (15), Italy (16), UK (3), North Macedonia (1). However, not all countries were able to report on this. These figures may have increased.

Table 7 provides a summary of current pharmacy measures and interventions on COVID-19 in Europe.

Table 7. Current pharmacy interventions on COVID-19 in Europe

	Pharmacy interventions on COVID-19	Provided in most (≥80%) pharmacies	Expanded powers granted to pharmacists	Remunerated by Government / Health Payer	Extra legislation passed in view of COVID-19
PREVENTION: Measures to reduce health risks of COVID-19 pandemic					
1	Patient information and education on preventive measures	32 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT	PL		PL; RS
2	Protocols in place for disinfection of pharmacy surfaces	31 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			RS
3	Use of disposable masks by pharmacy staff	30 countries: AT; BE; BG; HR; CZ; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT	BE; IE	BE; IT; LU; PL; SI	SI
4	Use of other Personal Protective Equipment by pharmacy staff	3 countries: IE; PL; EL			
5	Queue management in pharmacy	32 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			RS
6	Floor marking inside pharmacy	32 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			
7	Restriction in pharmacy opening hours	5 countries: BG; HR; EL; TR; RS			XK; RS
8	Barriers at counters in pharmacies	32 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			RS
9	Temporary suspension of patient care services	1 country: SE			
PREPAREDNESS: Measures to ensure timely and effective responses from the healthcare system					
10	Business continuity plan - for 1 st and 2 nd line pharmacy staff	10 countries: CZ; FI; IE; XK; LU; NO; SE; UK; RS; PT			
11	Stock and supply of essential medicines (as defined in your country)	20 countries: BE; HR; FI; FR; IE; LU; MK; NO; PT; RO; SI; SE; DK; EL; TR; DE; RS; EE; LV; MT	FI; IE	LU; MK; RO; SI; EL; TR; DE; RS; EE; MT	FI; IE; SK
12	Stock and supply of hand sanitizers	26 countries: BE; CZ; FI; FR; IE; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; EL; SK; TR; DE; RS; EE; HU; LV; MT	BE		CZ; NL; PL; EL; SK; TR; DE; RS
13	Stock and supply of protective masks	28 countries: BE; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; EL; SK; TR; DE; RS; EE; HU; LV; MT	BE	BE; FR	FR
14	Quantity limits for patient for the supply of individual medicines	11 countries: BE; HR; FI; FR; IE; NL; NO; PT; SI; SE; SK			FI; SI; SE

	Pharmacy interventions on COVID-19	Provided in most (≥80%) pharmacies	Expanded powers granted to pharmacists	Remunerated by Government / Health Payer	Extra legislation passed in view of COVID-19
RESPONSE: Immediate actions in response to COVID-19 pandemic					
15	Symptom-based referral pathways for suspected cases	31 countries: AT; BE; BG; HR; CZ; FI; FR; IE; IT; XK; LU; NL; MK; NO; PL; PT; RO; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			
16	Point-of-care antigen test-based referral pathways for suspected cases	3 countries: SE; UK; HU	FR; UK		FR
17	Increased demand / changes to repeat dispensing (=prescription renewal of chronic medications)	7 countries: AT; FR; IE; IT; PT; UK; RS	FR; IE; IT; PT; RS	IT; UK	FR; IE; PT; UK
18	Emergency supply of medications (without prescription)	7 countries: AT; BE; IE; IT; NO; PL; PT	IE; ES	ES	IE
19	Supply of those medicines, which are usually supplied in the hospital setting (e.g. oncology, antiretroviral)	7 countries: HR; FR; IE; XK; PT; ES; SE	HR; FR; PT; ES	HR; ES	FR; PT; ES
20	Increased demand / changes to home delivery of medicines	27 countries: AT; BE; HR; CZ; FI; FR; IE; IT; LU; NL; MK; NO; PT; RO; SI; ES; SE; UK; DK; TR; DE; RS; CY; EE; HU; LV; MT	ES; DE	FI; DK; DE; LV	CZ; LV
21	Hotline numbers for home delivery of medicines	8 countries: HR; FI; IE; IT; PT; SI; DE; LV			LV
22	Dealing with the supply of medicines shortages	14 countries: AT; BE; HR; FI; IE; IT; LU; NL; NO; PT; UK; EL; SK; DE	BE; HR; NL; PT; UK	NL; DE	DE
23	Preparing alcohol-based hand sanitizer formulations	19 countries: AT; BE; BG; HR; CZ; FR; IT; XK; LU; NL; PL; SI; ES; DK; EL; SK; TR; DE; CY	BE; CZ; FI; FR	HR; CZ; FI; SI; ES; DK; TR; DE; CY	NL; EL; SK; TR; DE
24	Pharmacy telephone support to vulnerable patients during isolation / lockdown	25 countries: HR; CZ; FI; FR; IT; XK; LU; NL; MK; NO; PL; RO; SI; ES; SE; UK; EL; TR; DE; RS; EE; HU; LV; MT; PT	FI; NL		LU
25	Hotline numbers / protocol for pharmacies for reporting on domestic violence during isolation / lockdown	6 countries: AT; IT; NL; PT; ES; EL	BE; FR; MT		FR; NL
26	Temporary waived prescription copayments for vulnerable patients	3 countries: BE; DK; RS	BE; FR; RS		FR
27	Drive thru pharmacy services (initiated or increased)	1 country: SE			
RECOVERY: Measures to return to "normal" activities post-pandemic					
28	Reestablishing normal patient care services and stock levels	31 countries: AT; BE; BG; HR; CZ; FI; FR; IT; XK; LU; NL; MK; NO; PL; PT; RO; SI; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT			UK
29	Dealing with the new vulnerable patients due to pandemic	30 countries: AT; BE; BG; HR; CZ; FI; FR; IT; XK; LU; NL; MK; NO; PL; PT; RO; ES; SE; UK; DK; EL; SK; TR; DE; RS; CY; EE; HU; LV; MT	UK	UK	
30	Referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19	3 countries: PL; SE; DK	FR	IT (regional scheme)	FR

AT: Austria; BE: Belgium; BG: Bulgaria; CZ: Czech Republic; CY: Cyprus; DK: Denmark; DE: Germany; EE: Estonia; IE: Ireland; EL: Greece; ES: Spain; FI: Finland; FR: France; HR: Croatia; HU: Hungary; IT: Italy; LV: Latvia; LU: Luxembourg; MK: North Macedonia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; RS: Serbia; SE: Sweden; SI: Slovenia; SK: Slovakia; TR: Turkey; UK: United Kingdom; XK: Kosovo






Table 8. Current pharmacy interventions on COVID-19 in Europe – country overview

	Country																																
Pandemic response stage	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	UK	XK	
PREVENTION: Measures to reduce health risks of COVID-19 pandemic																																	
Patient information and education on preventive measures																							€			♦							
Protocols in place for disinfection of pharmacy surfaces																										♦							
Use of disposable masks by pharmacy staff		€															€	€						€					€	♦			
Use of other Personal Protective Equipment by pharmacy staff																																	
Queue management in pharmacy																											♦						
Floor marking inside pharmacy																																	
Restriction in pharmacy opening hours																											♦						♦
Barriers at counters in pharmacies																											♦						
Temporary suspension of patient care services																																	
PREPAREDNESS: Measures to ensure timely and effective responses from the healthcare system																																	
Business continuity plan - for 1 st and 2 nd line pharmacy staff																																	
Stock and supply of essential medicines (as defined in your country)						€		€	€								€		€	€					€	€		€	♦	€			
Stock and supply of hand sanitizers					€	♦	♦		€	♦	€	€			€		€	€		€	♦	€	€			€	♦	€		♦	€	♦	€
Stock and supply of protective masks					€			€			€	€		€			€	€		€		€	€			€	€	€		€	€		
Quantity limits for patient for the supply of individual medicines											♦																	♦	♦				
continues on the next page																																	

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(Continuation)	Country																																
Pandemic response stage	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	UK	XK	
RESPONSE: Immediate actions in response to COVID-19 pandemic																																	
Symptom-based referral pathways for suspected cases																																	
Point-of-care antigen test-based referral pathways for suspected cases												♦														€							
Increased demand / changes to repeat dispensing (=prescription renewal of chronic medications)												♦			♦	€									♦							€	♦
Emergency supply of medications (without prescription)										€					♦																		
Supply of those medicines, which are usually supplied in the hospital setting (e.g. oncology, antiretroviral)										€	♦	♦	€												♦								
Increased demand / changes to home delivery of medicines					♦	€	€				€							€	♦														
Hotline numbers for home delivery of medicines																		♦															
Dealing with the supply of medicines shortages						€	♦															€											
Preparing alcohol-based hand sanitizer formulations				€	€	€	♦	€		♦	€	€		€								♦							€	♦	€	♦	
Pharmacy telephone support to vulnerable patients during isolation / lockdown																	♦																
Hotline numbers / protocol for pharmacies for reporting on domestic violence during isolation / lockdown												€	♦									♦											
Temporary waived prescription copayments for vulnerable patients												€	♦																				
Drive thru pharmacy services (initiated or increased)																																	
RECOVERY: Measures to return to “normal” activities post-pandemic																																	
Reestablishing normal patient care services and stock levels																																	
Dealing with the new vulnerable patients due to pandemic																																	€
Referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19												♦				€																	

AT: Austria; BE: Belgium; BG: Bulgaria; CZ: Czech Republic; CY: Cyprus; DK: Denmark; DE: Germany; EE: Estonia; IE: Ireland; EL: Greece; ES: Spain; FI: Finland; FR: France; HR: Croatia; HU: Hungary; IT: Italy; LV: Latvia; LU: Luxembourg; MK: North Macedonia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; RS: Serbia; SE: Sweden; SI: Slovenia; SK: Slovakia; TR: Turkey; UK: United Kingdom; XK: Kosovo

 Provided in most (≥80%) pharmacies
  Expanded powers granted to pharmacists
  Provided in most (≥80%) pharmacies and expanded powers granted to pharmacists
  Remunerated by Government / Payer
  Extra legislation passed in view of COVID-19

3.2.2. Evidence on pharmacy interventions on COVID-19

We identified 5 studies meeting inclusion criteria published between March and July 2020 and further 2 using hand search [15,205–210].

Three studies were from the UK, 2 from Ireland, 1 from Croatia, 1 from Poland.

The studies were published in 4 different journals: 2 in pharmacy journals; 1 in disease / medical journals; and 1 in patient experience journal.

Two studies were cross-sectional studies using surveys in community pharmacies during pandemic onset, 2 were literature reviews, and 3 were perspective papers reflecting on enhanced roles based on pharmacy interventions on COVID-19 undertaken by pharmacists.

The cross-sectional studies conducted in community pharmacies and the reviews identified a wide range of pharmacy measures and interventions on COVID-19 that were put in place within a short time. This include: 1) prevention measures to reduce health risks, such as: patient information and education not only on preventive strategies but also dealing with misinformation and questions on potential COVID-19 treatments; protocols for disinfection of pharmacy premises; use of masks and PPE; restrictions in opening hours; 2) preparedness measures to ensure timely and effective responses, such as: division of staff into teams, when possible; stock and supply of medicines; stock and supply of hand sanitizers and masks; limited quantity dispensed; 3) Immediate actions as response measures, such as: point-of-care antigen test-based referral pathways for suspected cases; increased demand or changes to repeat dispensing; changes in emergency supply; supply of certain hospital medicines; changes in home delivery; dealing with shortages; preparing alcohol-based hand sanitizer; remote support to vulnerable patients; protocol for reporting on domestic violence, and referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19 [206,209].

Merks et al. review novel legal authorizations granted to community pharmacists during COVID-19 pandemic which include the following in 11 European countries: e-prescribing; relaxation of regulations on controlled drugs; right to prepare alcohol-based and hand sanitizers; substitution right when in short supply due to shortages; dispensing certain hospital medicines; changes to emergency supply; changes to repeat dispensing of chronic medication; home delivery to vulnerable patients [205].

Finally, perspective commentaries offer a reflection on additional new roles for pharmacy relevant in public health crisis including most already reported in cross-sectional studies and reviews. Other roles could include: managing common ailments at reduced costs for patients; promoting medication adherence, medication review and disease management. These are all ways to alleviate pressure on health services; and to explore the opportunities in drive-thru pharmacy services [15,208,210].

Three papers reported difficulties experienced by pharmacies. This included: failure to obtain PPE from the health services to pharmacy staff; price increases by the wholesalers and suppliers; frequent inspections from authorities; extended working hours; dealing with angryerred patients; financial loss in the pharmacy; reimbursement delays to pharmacies; and staff mental health [206,208,209].

Table 9 summarizes the findings of our review of studies addressing pharmacy interventions on COVID-19 in Europe.

Table 9. Summary of findings of studies on pharmacy measures and interventions on COVID-19 in Europe

First author (month yr) [REF]	Objective	Country of origin	Study design	Pharmacy interventions on COVID-19	Other key findings
Cadogan CA (March 2020) [15]	To highlight additional roles that can be undertaken by community pharmacists in public health crisis and could help to alleviate pressure on general practice and other health areas	IE	Perspective paper	Additional roles for pharmacists relevant in public health crisis: 1) Managing minor ailments with OTC treatment at reduced costs for patients. 2) Extended prescribing roles, repeat dispensing, or emergency supplies at patient's request. 3) Stock supply and management, limiting quantity dispensed. 4) Promoting medication adherence in asymptomatic chronic disease patients, particularly in case of loss of income. 5) Pharmacist-provided medication reviews and chronic disease management supported by health services.	NR
Parkhurst C (May 2020) [208]	Describe the importance of community pharmacies during a public health crisis and the main difficulties experienced	UK	Perspective paper	Interventions provided by CP in UK: 1) Increasing number of patients in pharmacy for chronic disease management because of closed GP. 2) Stockpiling of medicines both prescription and OTC. 3) Restricted operating hours allowed. 4) Phone calls to GPs. 5) Home deliveries increased.	1) Queue management difficult to manage. 2) Failure of PPE to pharmacy staff by NHS. 3) Closure of pharmacies, financial impact; 4) Reimbursement delays to pharmacies. 5) Angered patients
Hayden JC (May 2020) [207]	To review the pandemic-related challenges and responses by pharmacists, as well as recommend areas of professional support and role expansion, particularly in mental health.	IE	Review	1) Pharmacy premises adapted. 2) Restricted opening hours. 3) Patient information on COVID-19, misinformation, preventive measures. 4) Division of staff into teams. 5) Stock management of medicines and sanitizers. 6) Sourcing alternatives for shortages. 7) Referral pathways for suspected cases. 7) Extended validity of prescriptions. 8) Expanded emergency supply. 9) Emergency supply of controlled drugs. 10) Delivery services. 11) Telephone / email for requests of vulnerable patients.	NR
Hoti K (June 2020) [206]	To explore the experiences of community pharmacists in relation to provision of community pharmacy services during COVID-19 pandemic	XK	Cross-sectional study (April)	1) Informing patients on medication currently being discussed for COVID-19. 2) monitoring patients for non-COVID health conditions. 3) Patient information on preventive measures. 4) Protocols in place for disinfection of surfaces. 5) Use of disposable masks by staff. 6) Use of PPE by staff. 7) Queue management. 8) Barriers at counters. 9) Increased demand of medication.	Negative: 1) Price increases; 2) Patient panic, stockpiling; 3) Worrying about getting infected; 4) Frequent pharmacy inspections; 5) Negative financial impact; 6) Extended working hours. Positive: 1) Moral and sense of duty; 2) Opportunity to align with other providers

First author (month yr) [REF]	Objective	Country of origin	Study design	Pharmacy interventions on COVID-19	Other key findings
Zaidi STR (July 2020) [209]	To understand the protective practices and well-being of pharmacists, and the delivery of pharmacy services during the COVID 19 pandemic.	UK	Cross-sectional study (May/June)	1) Increased number of patients. 2) Patient information on potential medicines for COVID-19. 3) Pharmacy premises reorganization. 4) Use of mask or PPE by pharmacy staff. 5) Limiting quantity dispensed. 6) Stock management. 7) Symptom-based referral pathway for suspected cases. 8) Dealing with significant or critical drug shortages. 9) Dealing with inappropriate behavior from patients or carers	Anxiety issues reported by pharmacy staff
Hussain R (July 2020) [210]	To provide an overview of opportunities and challenges of "drive-thru pharmacy services" in improving public health during this crisis.	UK	Perspective paper	Drive thru pharmacy services and enhanced IT enablers as an opportunity to improve protection and safety for staff and patients, faster dispensing, and convenience during COVID-19 pandemic	
Merks P (June 2020) [205]	To review the legal extension of the role of pharmacists in light of the COVID-19 pandemic	PL	Review	Novel legal authorizations granted to community pharmacists: AT : e-prescribing, relaxation of regulations on dispensing controlled medicines; BE : preparing alcohol, exclusive right to sell PPE, masks and alcoholgel. HR : Substitution of medicine in short supply, home delivery to vulnerable patients, increased quantity of haemophilia medication dispensed. CZ : Compounding antiseptic solutions, hand sanitizers, alcoholic gels, renewal of chronic treatment, protocol for reporting domestic violence. DE : preparation of alcoholic gel. IT : Administration of oxygen to patients, e-prescribing, home delivery to vulnerable patients, preparation of disinfectants. NL : video, telephone, email consultations, protocol for reporting domestic violence, preparation of disinfectant. PL : preparation of alcohol sanitizers, home delivery of medical devices, some prescribing authority. PT : Extension of emergency medicine delivery line to the whole country. ES : Home delivery to vulnerable and affected patients, dispensing hospital medicines in pharmacies. UK : extension of Minor Ailment Service and access to Emergency Care Summary Data, right to supply certain controlled drugs without prescription, home delivery to self-isolating patients	Several European countries adopted new legal solutions to mitigate drug shortages.

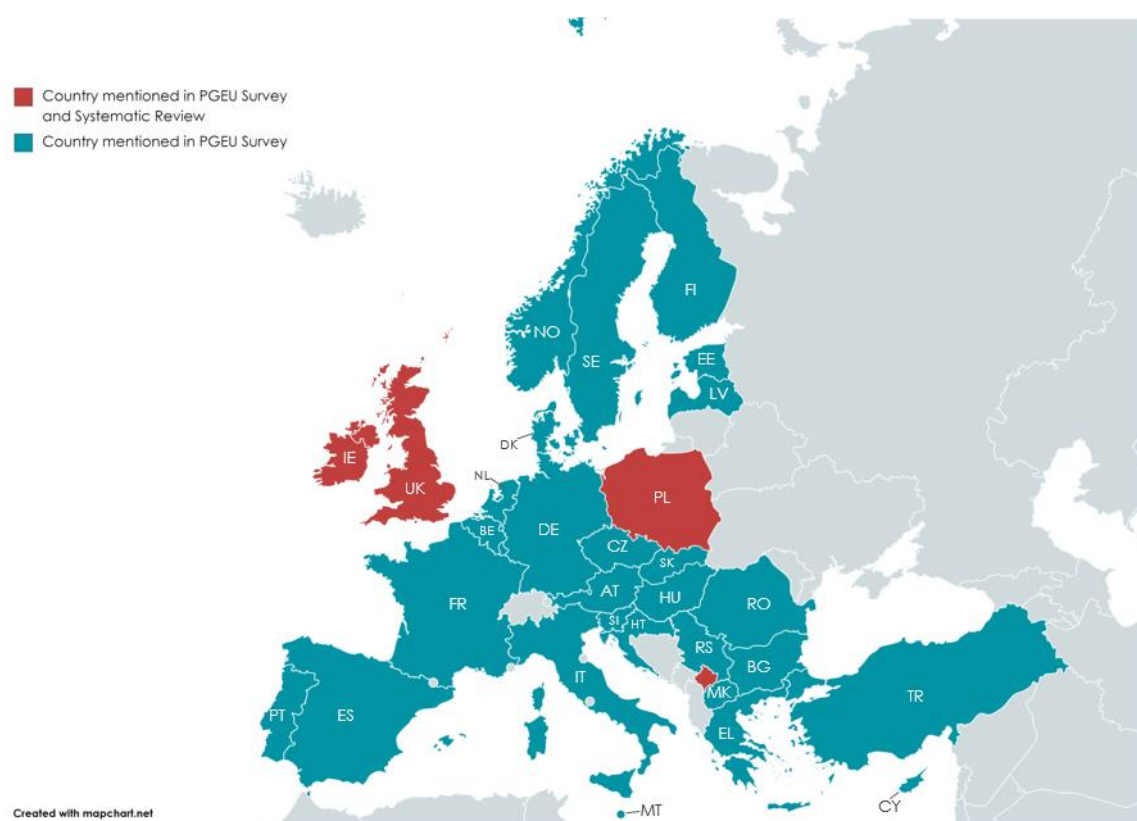
OTC: Over-The-Counter Medicines; CP: Community Pharmacies; PPE: Personal Protective Equipment; IT: Information Technology

AT: Austria; BE: Belgium; CZ: Czech Republic; DE: Germany; ES: Spain; HR: Croatia; IE: Ireland; IT: Italy; NL: The Netherlands; PL: Poland; PT: Portugal; UK: United Kingdom; XK: Kosovo; NR: Not Reported.

While mapping current practices of pharmacy interventions on COVID-19 in 32 countries in Europe was possible, however it was observed that the studies were published in 4 countries in Europe. It is, however, likely that the research on pharmacy interventions on COVID-19 will expand in the coming months.

Figure 4 illustrates the (still) scarce country research.

Fig. 4. Map of countries with research vs. practices of pharmacy interventions on COVID-19



4. DISCUSSION

4.1. Summary of key findings

In this research, we mapped current practices on 38 pharmacy services and 30 pharmacy interventions on COVID-19 in 32 countries in Europe. We also reviewed the evidence on pharmacy services targetting more than 25 health conditions stemming from 38 systematic reviews comprising 149 primary studies. These studies were conducted in community pharmacies across Europe.

4.1.1. Pharmacy services

The most frequent pharmacy services provided in a vast majority of countries in most pharmacies under contract, agreement, legislation, and regulation were mostly related to dispensing as this is the core role of pharmacies. Some of these services are reimbursed by the government or the health care payer outside the standard pharmacy dispensing remuneration. These services reflect priorities given to efficiency (generic substitution), safety (pharmacovigilance), pharmacy expertise in preparing individualized or short expiry therapy (galenic formulation), and access to medicines during out-of-hours (night services). Most used and reimbursed services in most countries also reflect prioritization related to access to medication (repeat dispensing and high-cost therapy dispensing and management).

The second tier of most frequent pharmacy services in countries provided under a regulatory framework acknowledges the role of pharmacies in ensuring safety (emergency supply, urgent supply, refusal to dispense for safety reasons). This tier includes the first patient care service, medication review, not dispensing related, which is already reimbursed in most countries.

The third tier embraces a very different and wide spectrum of services provided and reimbursed outside the standard pharmacy dispensing remuneration in some countries. This goes far beyond the dispensing role, acknowledging the role of

pharmacies in adherence (dose administration aid, instruction on the use of devices, supervised consumption of medicines, first time dispensing intervention), integrated care pathways with primary care, and includes health promotion activities including pharmacist-delivered vaccination.

The fourth tier of services provided and already reimbursed within a regulatory framework in some countries includes newer roles for pharmacies in health promotion, screening, and disease management, such as smoking cessation, chronic disease management, common/minor ailment management, home or nursing home medication review and weight management.

In summary, the country mapping portrays numerous and diverse pharmacy services currently provided in Europe. This is far beyond the dispensing roles and some services are already reimbursed in some countries. This acknowledges the roles of pharmacies in health promotion, screening, disease, and in case management.

These findings are aligned with recommendations described in policy papers on integrated models of primary care, patient centered, and with more economic incentives that pursue expanded roles of pharmacy services [2–7].

There is substantial evidence on pharmacy services in systematic reviews covered in this research. However, this is not without methodological challenges. This is of typical of complex health interventions which operate at different levels (health systems, pharmacy settings, pharmacist, and patients).

Positive evidence of pharmacy services stemming from systematic reviews is fairly established for screening and referral (cardiovascular risk, diabetes, asthma and COPD, depression, osteoporosis, some cancers). Also, it well established for chronic disease management (e.g. cardiovascular risk, hypertension, diabetes, lipid, asthma), medication review or medication management, smoking cessation, and therapeutic adherence support. However, some studies present mixed or unclear results which may be due to: poor study designs; using broader scope of

population, intervention, and diverse outcomes.; and some interventions are poorly defined or presenting implementation issues, especially in standardization.

The systematic reviews also included studies on first time dispensing; integrated care pathways with primary care; medication reconciliation; common / minor ailments. However, they are few in numbers. The sparse evidence on these services may exist because some are either recent and/or limited to only few countries.

Systematic reviews covered in this research did not include primary studies addressing dispensing related services or for few other services (e.g. needle exchange, deprescribing, handling and disposal of expired or unwanted medicines). This is despite published studies available on some of these services however these were not included in these systematic reviews. This is likely due to limitations of our methodology (overview of systematic reviews) and/or limitations of our search strategy.

The overview of research conducted sought to include relevant overviews and systematic reviews complying with inclusion criteria with no restrictions on populations, interventions, comparators, or outcomes. This was done in attempt to be inclusive.

We identified the study design of primary studies included in systematic reviews using Cochrane EPOC study designs. We also assessed the direction of findings of effectiveness, impact, and economic evaluation studies. This assessment was performed for EPOC study designs and for cross-sectional screenings that reported referral performed by pharmacist.

The findings of this overview are consistent with reported results and issues described in the other overviews of systematic reviews [10,13,18,19]. In addition, these other overviews have also showed positive evidence for pharmacist-delivered flu vaccination and for pharmacists' delivered needle exchange services.

The proportion of economic evaluation studies with positive trend on total economic evaluation studies covered in these systematic reviews is lower (46%) than reported results in overview of Costa (71%) [10]. This is most likely because our overview was restricted to Europe and not focused on systematic evaluations of economic evaluation of pharmacy services and hence did not include many published studies on economic evaluation of pharmacy services.

The findings of this overview are aligned with recommendations of pursuing expanded roles and adequate remuneration of pharmacy services described in other overviews: policy changes favouring expanded roles of pharmacists require the integration of community pharmacists within the health system, a public informed about the new roles; performance-based incentives; and information systems in place [13]; complex health interventions delivered by pharmacists should be better standardized in future to reduce the variability which requires a closer collaboration between researchers and practitioners [18]; there is evidence that supports expanded roles of community pharmacists in health promotion and disease prevention public health programs, future studies should report impact of community pharmacy services on health inequalities [19].

4.1.2. Pharmacy interventions on COVID-19

The European country reports portray a wide array of pharmacy interventions on COVID-19 implemented in most pharmacies. This was done in several countries within a very short time frame. This reflects the highly reactive and adaptative character of pharmacies in response to the pandemic outbreak.

All 30 mapped pharmacy interventions and measures on COVID-19 have been provided throughout Europe although some more extensively than the others.

Almost all preventive measures to reduce health risks of COVID-19 (patient information, protocols for disinfection of surfaces, use of disposable masks, floor marking, and barrier at counters) have been the most frequent interventions

provided in most pharmacies in almost every country. Conversely, the use of PPE by staff, restricted opening hours, and temporary suspension of patient care services were not applied in most countries with a few exceptions. This is coherent with possible difficulties in accessing PPE, extended operations in response to stockpiling and may reflect, to a certain degree, a shift of some primary care patient care services to pharmacies.

The most frequent reported measures to ensure timely and effective responses from the healthcare system included stock and supply of medicines, as well as hand sanitizers and masks. This reflected the pharmacies preparedness for stockpiling and increased demand for services and products.

It is also interesting to note that most frequent immediate actions in response to pandemic include symptom-based referral pathways for suspected cases, increased demand to home delivery of medicines, pharmacy telephone support to vulnerable patients during isolation and dealing with the new vulnerable patients. These are all important patient care interventions in screening, access, and vulnerable patient support. This exceeds far beyond pharmacist's traditional dispensing role.

Even more interesting are expanded powers granted to pharmacies and legislation passed in view of COVID-19. This allowed pharmacies to provide certain services reflecting the need to provide improved and faster access to medication and relevant products, patient screening as well as referral. This also included support to vulnerable patients through an organized, reliable, and safe network.

Emergency temporary closures of pharmacies also occurred in several countries. This impacted on patients' access and patient care and have a negative economic impact. In small towns this also means that this could be a risk of reputation damage, when temporary closures occur.

Research on pharmacy interventions on COVID-19 is still scarce and it is in its infancy stage. However, the literature has confirmed the wide array of

interventions provided and expanded powers granted to pharmacies to combat COVID-19.

Pharmacy associations also played an important supporting role to pharmacists by developing and updating guidance and emergency plans to assist community pharmacists. An editorial paper from April 2020 outlines how countries outside Europe learned from guidance developed by pharmacy associations in Europe. This paper highlighted the role of pharmacists in the COVID-19 pandemic, namely by providing services amidst pandemic, including screening, seeing patients and reducing the patients' burden on health care facilities such as hospitals and General Practitioner (GP) practices, providing home deliveries, as well as dealing with the increasing number of patients coming through to pharmacies with the other ailments. Guidelines from pharmacy associations have been adopted and adapted by other countries [211], including by the International Pharmaceutical Federation (FIP) which created a hub of information for pharmacists worldwide [212].

The World Pharmacy Council (WPC) also released an important report in September 2020 highlighting the frontline role of community pharmacy during the COVID-19 pandemic, examining the learnings so far, and making recommendations for the future [213].

4.2. Strengths and limitations

4.2.1. Strengths

This research is, to our best knowledge, the first using a comprehensive mixed methods approach combining mapping of current practices of pharmacy services and interventions on COVID-19 in 32 countries in Europe.

We generated a list of 38 pharmacy services and further hierarchized them under the Kaiser pyramid care model. This enabled to interpret findings on pharmacy services in terms of stratified population health management.

Similarly, we generated a list of 30 pharmacy interventions on COVID-19 and further classified them under the categories which correspond to the steps in response to public health emergencies, building on the work of previous authors. This enabled to interpret findings on pharmacy interventions on COVID-19 in terms of stages used in response to public health emergencies.

We used the overview of existing overviews and systematic reviews of pharmacy services meeting inclusion criteria as a method to collect robust evidence within a short period of time available for this research. We prioritized the evidence by first looking at existing overviews (reviews of systematic reviews), at included systematic reviews and, where necessary, at included primary studies of pharmacy services. For interventions on COVID-19 we used a review of primary studies as there are no systematic reviews yet available.

Randomized trials are the gold standard in assessing efficacy. However, they may not fully capture effectiveness in real-world practice and may be impractical. Hence, study designs for the effectiveness of health care interventions tend to be more flexible. However, there must be a balance between acceptable and robust study designs under real-world constraints vs accepting all evidence regardless of study design. The direction of effect reported for the evidence on pharmacy services used a conservative approach and was performed on studies that followed Cochrane EPOC study designs and cross-sectional when reporting referral performed for high-risk patients, in attempt to report results of more robust study designs.

4.2.2. Limitations

Mapping current practices relied on reported data from one or two individuals, hence, this could vary from the real practice. However, it would have been impractical to perform surveys to a representative sample of pharmacies in all 32 countries and it is acknowledged that country pharmacy organizations tend to have a fair knowledge on current practices of most pharmacy services.

Pharmacy services are complex health interventions which operate at different levels. In complex health interventions, variations exist for the same intervention under different health systems, different pharmacies, different pharmacists within the same pharmacy, and real-world patients. This is different to the controlled environments such as clinical trials. This creates challenges not only in terms of diverse practices but also researching complex health interventions, including pharmacy, as this tends to present heterogeneity.

While an overview of systematic reviews allows for a quicker method to collect robust evidence within a short period of time, it is also not without challenges. As the detail available in original primary studies may not be reported in systematic reviews containing these studies, there is a risk for incomplete relevant data. In fact, in this research abstracts of primary studies were reviewed to collect accurate data on study designs and trend.

This overview also presents very diverse populations, interventions, and outcomes. In particular, the heterogeneity in outcomes within and across interventions did not enable to present trends per outcome.

Most systematic reviews were not exclusive to community pharmacy. In fact, most addressed a specific health condition or intervention in different settings, including community pharmacy. This may explain the reason for these reviews not including some pharmacy services, albeit existing studies in the literature but probably not included in these reviews.

Most systematic reviews did not restrict to community pharmacy nor to Europe, allowing for different settings and geographies. We tried to overcome this issue by selecting primary studies of systematic reviews performed in community pharmacy in Europe. We could have restricted systematic reviews to the community pharmacy setting only. However, this would also result in a narrower selection which could have excluded relevant primary studies and interventions.

We found some conflicting evidence or relevant missing data across retrieved systematic reviews containing the same primary studies. We tried to address this issue by reviewing abstracts of primary studies where conflicting evidence or missing data existed. This was in attempt to present more accurate results.

This overview did not include grey literature due to time constraints. Hence, we may have missed additional relevant evidence on pharmacy services and, especially, on pharmacy interventions on COVID-19.

4.3. Implications for research

There is room for improvement in future research to fill in some gaps and provide additional evidence.

While mapping of current practices of pharmacy services reflects data from 32 countries in Europe, our overview derived evidence from systematic reviews that included primary studies conducted only in just 15 countries.

This is relevant because there is an efficacy-effectiveness gap around certain pharmacy services, with a substantial amount of efficacy studies available for certain established interventions but fewer studies performed in different jurisdictions to assess the effectiveness in different real-world health systems, pharmacy settings, pharmacists and staff, and populations.

The gap between practices and research on pharmacy interventions on COVID-19 is wider although it will reduce, as more research gets published.

Further research is required for recent interventions, such as first time dispensing in selected therapies, integrated care pathways with primary care, medication reconciliation at patient discharge, common / minor ailments, as these interventions help to move forward integrated care and improve patient outcomes.

We recommend researchers adopt EPOC study designs in future evaluations; defining standard sets of outcomes per intervention valid yet feasible to collect

through pharmacies; addressing equity issues by assessing the impact of pharmacy services on vulnerable patient subgroups; and including experimental remuneration of pharmacies in research studies.

Finally, although economic evaluations of pharmacy services are more recent in Europe there is already some evidence on the cost-effectiveness and cost-utility of certain services. There is also room for improvement, but methods and designs have improved substantially in the last 5 years, supporting reimbursement decisions for health care payers, as this is highly relevant for policymaking

4.4. Implications for policy and practice

Practice tends to precede research and moves forward at a much faster pace. So is the case with pharmacy services and pharmacy interventions on COVID-19. Current practices portray a wide spectrum of interventions, some of them reimbursed or, in the case of pandemic, with expanded powers granted or legislation changes in response to the needs arising from the course of events.

In recent years, profound changes in pharmacy remuneration systems have happened several European countries. The major component remunerates for dispensing, acknowledging the core role of pharmacies for providing equitable, safe, quality access, and pre-financing of medicines and other health products on behalf of payers at the point of delivery. Other components include efficiency and/or quality incentives. In recent years, some pharmacy services have been reimbursed by payers acknowledging newer roles of pharmacies in health promotion, screening, disease management, and case management.

Implications for policy and practice may include: targeting interventions with high potential to add value to society; standardizing population, intervention and outcomes to reduce heterogeneity; developing digital-driven communication between pharmacies and other providers in interventions with referral or integrated care pathways; considering joint research efforts in countries interested

in building evidence around a particular intervention seeking to pursue a more combined strategy while taking into account country specifics; reflecting on possible payment models remunerating for value-added patient care services beyond dispensing linked to outcomes.

Finally, pharmacies have been able to implement a wide array of interventions on COVID-19, some of them beyond dispensing and which may have contributed to alleviate the burden on other health care services and provide valuable support to patients. Expanded powers granted and legislation passed acknowledge that contribution, which could be extended to other countries and pave the way to explore further roles in vaccine administration (when it becomes available), point-of-care antigen-based test screening and referral, and referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19.

Lessons learned from pharmacies' involvement in response to this pandemic crisis should also raise questions on the relevance of involving this network of health care providers in future country preparedness plans for public health emergencies.

4.5. Final remarks

This research is, to our best knowledge, the first using a comprehensive mixed methods approach combining mapping of current practices of pharmacy services and interventions on COVID-19 in 32 countries in Europe with review of published evidence, hence providing a near accurate portrayal of current practices, trends and evidence of pharmacy services in Europe.

We hope it may assist in improving the design, implementation, and research on pharmacy services, and in raising relevant policy questions. This could drive value-based health care that make the best use of community pharmacies.

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APPENDICES

Appendix 1 – Country Survey Part 1: Pharmacy Services

Appendix 2 – Glossary of Pharmacy Services

Appendix 3 – Search strategy

Appendix 4 – Country Survey Part 2: Pharmacy Interventions on COVID-19

Appendix 1 – Country Survey Part 1: Pharmacy Services

The Institute for Evidence-Based Health (ISBE) is conducting research for the Pharmaceutical Group of the European Union (PGEU) which aims at synthesizing evidence and trends regarding pharmacy services in Europe. The purpose of this survey is to collect data for this study. The results will be made public in due course. We kindly request you to complete the following survey as accurate as you can.

Country: _____

	PHARMACY SERVICES	Provided in most pharmacies under contract, agreement, legislation, or regulation (Y/N) <i>If Y please indicate National / Regional / Local</i> <i>If Y and available, please provide name and link to document</i>	Provided in some pharmacies as a pilot (Y/N) <i>If Y and available, please provide link to document</i>	Remunerated by Government /Payer (Y/N/In some cases) <i>If Y and available, please provide latest fees and currency</i>	Provided individually by some pharmacies (Y/N)	Regulatory limitations (Y/N)	Description of Intervention (Name, frequency, duration, disease or condition, medicines, target population) <i>If available, please provide link to document or reference</i>	Other data sources <i>Please provide link or reference</i>	OBS
DISPENSING SERVICES									
1	Night services								
2	Emergency supply of prescription-only medicines without prescription (e.g. adrenaline, salbutamol)								
3	Urgent supply of prescription-only medicines without prescription (e.g. patient on holiday)								
4	Repeat dispensing (chronic long-term medications)								
5	Generic Substitution								
6	Refusal to dispense due to safety reasons								
7	Home delivery								
8	Other _____								
HEALTH PROMOTION SERVICES									
9	Handling and Disposal of Expired or Unwanted Medicines								
10	Needle/Syringe Exchange								
11	Pharmacy Travel Health								
12	Pharmacist-delivered vaccination (e.g. Flu)								
13	Weight Management								
14	Smoking Cessation								
15	Health education								
16	Other _____								

Appendix 1 – Country Survey Part 1: Pharmacy Services (cont.)

	PHARMACY SERVICES	Provided in most pharmacies under contract, agreement, legislation, or regulation (Y/N) <i>If Y please indicate National / Regional / Local</i> <i>If Y and available, please provide name and link to document</i>	Provided in some pharmacies as a pilot (Y/N) <i>If Y and available, please provide link to document</i>	Remunerated by Government / Payer (Y/N/In some cases) <i>If Y and available, please provide latest fees and currency</i>	Provided individually by some pharmacies (Y/N)	Regulatory limitations (Y/N)	Description of Intervention (Name, frequency, duration, disease or condition, medicines, target population) <i>If available, please provide link to document or reference</i>	Other data sources <i>Please provide link or reference</i>	OBS
SCREENING AND REFERRAL SERVICES									
17	Common Ailment Management Schemes (e.g. Strep-A, UTI / Cystitis)								
18	Screening individuals at-risk not on medication (e.g. for diabetes, hypertension, lipid disorder, HIV, Hep B, Hep C, colon cancer)								
19	Predictive medicine (e.g. genetic risk)								
20	Pharmacovigilance for medicines under additional monitoring (e.g. screening questions for black triangle medicines)								
21	Scheduling visits / exams, delivery of reports								
22	Referral to other healthcare providers (e.g. nurses and nutritionists)								
23	Other _____								
DISEASE MANAGEMENT SERVICES									
24	Administering injectable medicines (e.g. antibiotics)								
25	Directly observed treatment/ Supervised Consumption of Medicines								
26	First time dispensing intervention (e.g. New Medicines Service)								
27	Instruction on use of therapeutic, self-monitoring device or medical aid (e.g. stoma appliance, inhaler, insulin device, self-monitoring blood glucose)								
28	Therapeutic adherence support								

Appendix 1 – Country Survey Part 1: Pharmacy Services (cont.)

	PHARMACY SERVICES	Provided in most pharmacies under contract, agreement, legislation, or regulation (Y/N) <i>If Y please indicate National / Regional / Local</i> <i>If Y and available, please provide name and link to document</i>	Provided in some pharmacies as a pilot (Y/N) <i>If Y and available, please provide link to document</i>	Remunerated by Government /Payer (Y/N/In some cases) <i>If Y and available, please provide latest fees and currency</i>	Provided individually by some pharmacies (Y/N)	Regulatory limitations (Y/N)	Description of Intervention (Name, frequency, duration, disease or condition, medicines, target population) <i>If available, please provide link to document or reference</i>	Other data sources <i>Please provide link or reference</i>	OBS
29	Teleconsultations by pharmacists								
30	Chronic disease management (e.g. hypertension, hyperlipidemia, diabetes, asthma, COPD, NOAC)								
31	Other _____								
INDIVIDUAL CASE MANAGEMENT SERVICES									
32	Dose Administration Aid								
33	Medication Review								
34	Home or Nursing Home Medication Review								
35	Medication Reconciliation								
36	Therapeutic Substitution								
37	Deprescribing (e.g. benzodiazepines, antidepressants)								
38	Integrated care pathways / protocols or Quality Circles in place with primary care								
39	High-Cost Therapy Dispensing and Management (e.g. Oncology, HIV, Rheumatoid Arthritis, Multiple Sclerosis)								
40	Drug dose titration (e.g. Insulin)								
41	Galenic formulation								
42	Other _____								
SERVICES BASED ON HEALTH TECHNOLOGY ASSESSMENT (HTA)									
43	Data collection on the effectiveness of new medicines								
44	Other _____								

UTI: Urinary Tract Infection; Hep: Hepatitis; COPD: Chronic Obstructive Pulmonary Disease; NOAC: New Oral Anticoagulants; OBS: Observations

THANK YOU

Appendix 2 – Glossary of Pharmacy Services

Pharmacy Service	Synonyms	Description
DISPENSING SERVICES		
Night services		Night Services are on-call or extended opening services that increase the accessibility to community pharmacies.
Emergency Supply of Prescription-only Medicines without Prescription		Supply of a prescription medication in an emergency/lifesaving situation (e.g. adrenaline; salbutamol).
Urgent Supply of Prescription-only Medicines without Prescription		Supply of a prescription medication upon request from a patient previously prescribed it, in an urgent situation, without a prescription, to avoid discontinuation of therapy. E.g. patient on holiday; ran out of medicine and cannot obtain a prescription.
Repeat Dispensing (chronic long-term medications)	Continued Dispensing Medication Continuance	System/service whereby repeat issues of prescriptions (e.g. for medications for chronic diseases) are managed (held) by the pharmacy and dispensed when required/due to the patient without needing to request a prescription from the physician; the pharmacy holds future issues of the prescription in the pharmacy which are pre-authorised by the prescriber for a set duration (e.g. 3, 6 or 12 months).
Generic Substitution		The practice of exchanging at pharmacy level one medicine instead of another with the same active substance, strength and pharmaceutical from another manufacturer, without consulting the prescriber.
Refusal to dispense due safety reasons	Refusal to fill Non-dispensing (fee)	In dispensing a prescription, a pharmacist has to exercise an independent judgement to ensure the medicine is safe and appropriate for the patient; at all times the dispensing of a prescription or any other action taken by the pharmacist, must be consistent with the safety of the patient; pharmacist can refuse to dispense the medicine due to safety reasons.
Home delivery		Delivering medicines and healthcare devices at patients' home
HEALTH PROMOTION SERVICES		
Handling and Disposal of Expired or Unwanted Medicines	Pharmacy waste management	Disposal of Medicines Waste includes safe disposal of expired or un-used medicines in pharmacy.
Needle/Syringe Exchange		Service where intravenous drug users can obtain clean injecting equipment, support and information. It is usually complemented by support for self-care and referral to another health or social care professional if needed.
Pharmacy Travel Health	Travel Medicine	Provide pre-travel counselling on individual risk; vaccines administration.
Pharmacist-Delivered Vaccination	Pharmacy-based vaccination Pharmacy-delivered Immunization	Administration of the vaccine by a certified community pharmacist.
Weight Management	Weight control	The service delivers a patient-centred, integrated weight management service to improve patients' health and quality of life. The service provides psychological support and makes behavioural interventions, as well as interventions to increase physical activity and improve diet. Where appropriate, pharmacological interventions may also be provided.
Smoking Cessation		Performing counselling and select the most appropriate therapy (e.g. Nicotine Replacement Therapy) to help people give up smoking.
Health education		Providing patient counseling on health promotion, lifestyle modifications and disease prevention
SCREENING AND REFERRAL SERVICES		
Common Ailment Management	Minor Ailments Service (MAS) Common Ailments Service	Providing medicines and advice to patients with common health conditions which can be managed without visiting a physician. It can include the option to prescribe over-the-counter (OTC) and/or prescription-only medicines by the pharmacist, and referral to another health care professional if needed. It may or may not include point-of-care testing (e.g. HIV, HBV, HCV, Strep A test).
Screening Individuals At-Risk		Performing a point-of-care test (e.g. blood glucose, blood pressure, total cholesterol) or a screening validated questionnaire, or both to identify individuals at risk of chronic disease and not on medication, provide counselling

Appendix 2 – Glossary of Pharmacy Services (*cont.*)

		and/or referral to a physician or to another health care professional (e.g. nutritionist). E.g. for diabetes, hypertension, cardiovascular disease, asthma, COPD, colon cancer.
Predictive Medicine		Predictive medicine is a branch of medicine that aims to identify patients at genetic risk of developing a disease, thereby enabling either prevention or early treatment of that disease. Either single or more commonly multiple tests are used to identify markers of future predisposition to a disease.
Pharmacovigilance for medicines under additional monitoring		In the European Union (EU), medicines that are being monitored particularly closely by regulatory authorities are labelled with a black inverted triangle (▼) in the product information. These medicines are described as being under 'additional monitoring' and usually require a screening prior to dispensing. Additional monitoring aims to enhance reporting of suspected adverse drug reactions for medicines for which the clinical evidence base is less well developed. The main goals are to screen prior to dispensing and collect information as early as possible to inform the safe and effective use of these medicines and their benefit-risk profile when used in everyday medical practice.
Scheduling visits and exams/delivery of reports		Complementary services provided on behalf of patients to schedule visits and exams in pharmacy or primary care and provide patients with health reports.
Referral to other healthcare providers		Referring patient to other healthcare providers such as nurse or nutritionist.
DISEASE MANAGEMENT SERVICES		
Administering Injectable Medicines	Injection Authority	Administration of an injectable medicine (e.g. antibiotics, anti-inflammatory drugs, adrenaline) by a certified community pharmacist.
Directly Observed Treatment (DOT)	Directly observed therapy Supervised Consumption of Medicines	A method of drug administration in which the pharmacist observes as a person takes each dose of a medication to ensure the person receives and takes all medications as prescribed and to monitor response to treatment. E.g. Methadone, buprenorphine, antibiotics, medicines for the treatment of tuberculosis, HIV etc, others.
First Time Dispensing Intervention	New Medicines Service	A structured, private consultation between a pharmacist and a patient starting a new medication focusing on supporting adherence in the first months of treatment. It may or may not include SMS refill / adherence reminders to patients.
Instruction on use of therapeutic or self-monitoring device or medical aid (e.g. stoma appliance, inhaler, insulin device, self-monitoring blood glucose (SMBG))	Stoma Appliance / Stoma Service Inhaler Technique SMBG education	A structured approach that involves teaching, demonstrating, and assessing the correct use of a device.
Therapeutic adherence support		Structured service/program to identify possible issues related to therapy adherence and provide solutions and motivation. It may or may not include SMS refill / adherence reminders to patients.
Teleconsultations by pharmacists		The possibility for pharmacists to consult and provide patients/public with advice by phone or online.
Chronic disease management (e.g. hypertension, hyperlipidemia, diabetes, asthma, COPD, NOAC)	Disease management	A multi-component pharmacy intervention aiming to control symptoms and slow or stop chronic disease progression. This can include the detection of early signs or changing in a patient's condition, medication monitoring, medication review, adherence support and disease self-care support. It may or may not include SMS refill / adherence reminders to patients. It may or may not include point-of-care measurements (e.g. blood glucose, blood pressure, total cholesterol).
INDIVIDUAL CASE MANAGEMENT SERVICES		
Dose Administration Aid (DAA)	Pill-box Blister pack Preparation of personalized dosage systems	A personalized dosage system or DAA is a device or packaging system for organizing doses of medicines according to the day of the week and time of the day that they need to be taken.
Medication Review	Medication Therapy Management (MTM) Medication Use Review (MUR)	A structured evaluation of patient's medicines with the aim of optimizing medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions. It may or may not include SMS refill / adherence reminders to patients.

Appendix 2 – Glossary of Pharmacy Services (*cont.*)

	Polymedication management Medcheck Medicines/Therapy/Medication optimization	
Home or Nursing Home Medication Review	Home Medicines Review Residential Medication Management Reviews	Medicines review performed at patients' homes or in nursing homes by a community pharmacist.
Medication Reconciliation		The process of comparing the medications a patient is taking (and should be taking) with newly ordered medications to resolve discrepancies or potential problems. E.g. After hospital discharge.
Therapeutic Substitution		The practice of exchanging at pharmacy level one medicine instead of another with a different active substance and with the same therapeutic intent, in consultation with the prescriber and patient or in accordance with national/local protocols.
Deprescribing		Identifying, reducing, and withdrawing medication when the risks of the drug outweigh its clinical benefits (e.g. benzodiazepines, antidepressants, potentially inappropriate medicines in elderly).
Integrated Care Pathways / protocols or Quality Circles in place with primary care		Agreed structured pathways of care and interprofessional local meetings between pharmacists, general practitioners (and sometimes primary care nurses) to identify and resolve potential medication and healthcare issues.
High-Cost Therapy Dispensing and Management	Dispensing specialty medicines	Dispensing expensive high value medicines (e.g. biological or biosimilar medicines) to patients in the community pharmacy (e.g. Oncology, HIV, Rheumatoid Arthritis, Multiple Sclerosis).
Drug-dose titration		Process of adjusting the dose of a medication by pharmacist, usually with narrow therapeutic index, for the maximum benefit of patient without adverse effects by increasing or decreasing slowly (e.g. insulin, anticoagulants) under agreed protocol or patient directions from physician.
Galenic formulation		Extemporaneous compounding medicines prepared at the pharmacy for an individual patient.
SERVICES BASED ON HEALTH TECHNOLOGY ASSESSMENT (HTA)		
Data collection on new medicines under conditional reimbursement	Real-World monitoring of effectiveness (pharmacy-based)	Collecting and recording patient-level effectiveness metrics of new (recently launched) and innovative medicines during dispensing (usually these are medicines under confidential contracts between Payer and Market Authorization Holder which grants temporary reimbursement provided the company is able to demonstrate effectiveness in the real-world population within the first year(s) of launch under Health Technology Assessment procedures).

Appendix 3 – Search strategy

All searches performed until 5 August 2020.

SEARCH #1

Systematic reviews of pharmacy services

MEDLINE® (via PubMed®), CDSR, CRD (DARE+NHS EED+HTA), Google Scholar

Filter applied for systematic reviews and meta-analysis for publication date = last 7 years or since 1 January 2013 until August 2020 (except for Google Scholar which used search since 1 January 2020).

("Systematic review" OR "meta-analysis") AND (pharmacy OR pharmacist) AND (intervention OR service OR services OR program OR programs OR programme OR programmes OR management) NOT hospital NOT clinic NOT ambulatory NOT inpatient

SEARCH #2

Individual studies of pharmacy interventions on COVID-19

MEDLINE® (via PubMed®), Google Scholar.

Search date since 1 January 2020 until August 2020.

(pharmacy OR pharmacist) AND ("COVID-19" OR "coronavirus" OR "SARS-CoV-2") NOT hospital NOT clinic NOT ambulatory NOT inpatient

Appendix 4 – Country Survey Part 2: Pharmacy Interventions on COVID-19

The Institute for Evidence-Based Health (ISBE) is conducting research for the Pharmaceutical Group of the European Union (PGEU) which aims at synthesizing evidence and trends on pharmacy services in Europe. This research also includes a subset on recent pharmacy interventions on COVID-19 in Europe. The purpose of this section of the survey is to collect data for this subset. The results will be made public in due course. We kindly request you to complete the following survey as accurate as you can.

Country: _____

	PHARMACY INTERVENTIONS ON COVID-19	Provided in most (≥80%) pharmacies (Y/N)	Expanded powers granted to pharmacists through amending regulations (Y/N) <i>If Y, please provide link or reference</i>	Remunerated by Government / Payer (Y/N) <i>If Y and available please provide fees and currency</i>	Extra legislation passed by pharmacy regulators in view of covid-19 (Y/N) <i>If Y, please provide link or reference</i>	Other data sources <i>Please provide links or references</i>	OBS
PREVENTION: Measures to reduce health risks of COVID-19 pandemic*							
1	Patient information and education on preventive measures						
2	Protocols in place for disinfection of pharmacy surfaces						
3	Use of disposable masks by pharmacy staff						
4	Use of other Personal Protective Equipment by pharmacy staff						
5	Queue management in pharmacy						
6	Floor marking inside pharmacy						
7	Restriction in pharmacy opening hours						
8	Barriers at counters in pharmacies						
9	Temporary suspension of patient care services						
PREPAREDNESS: Measures to ensure timely and effective responses from the healthcare system*							
10	Business continuity plan - for 1 st and 2 nd line pharmacy staff						
11	Stock and supply of essential medicines (as defined in your country)						
12	Stock and supply of hand sanitizers						
13	Stock and supply of protective masks						

Appendix 4 – Country Survey Part 2: Pharmacy Interventions on COVID-19 (cont.)

	PHARMACY INTERVENTIONS ON COVID-19	Provided in most (≥80%) pharmacies (Y/N)	Expanded powers granted to pharmacists through amending regulations (Y/N) <i>If Y, please provide link or reference</i>	Remunerated by Government / Payer (Y/N) <i>If Y and available please provide fees and currency</i>	Extra legislation passed by pharmacy regulators in view of covid-19 (Y/N) <i>If Y, please provide link or reference</i>	Other data sources <i>Please provide links or references</i>	OBS
14	Quantity limits for patient for the supply of individual medicines						
RESPONSE: Immediate actions in response to COVID-19 pandemic*							
15	Symptom-based referral pathways for suspected cases						
16	Point-of-care antigen test-based referral pathways for suspected cases						
17	Increased demand / changes to repeat dispensing (=prescription renewal of chronic medications)						
18	Emergency supply of medications (without prescription)						
19	Supply of those medicines, which are usually supplied in the hospital setting (e.g. oncology, antiretroviral)						
20	Increased demand / changes to home delivery of medicines						
21	Hotline numbers for home delivery of medicines						
22	Dealing with the supply of medicines shortages						
23	Preparing alcohol-based hand sanitizer formulations						
24	Pharmacy telephone support to vulnerable patients during isolation / lockdown						
25	Hotline numbers / protocol for pharmacies for reporting on domestic violence during isolation / lockdown						
26	Temporary waived prescription copayments for vulnerable patients						
27	Drive thru pharmacy services (initiated or increased)						
RECOVERY: Measures to return to "normal" activities post-pandemic*							
28	Reestablishing normal patient care services and stock levels						
29	Dealing with the new vulnerable patients due to pandemic						

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Appendix 4 – Country Survey Part 2: Pharmacy Interventions on COVID-19 (cont.)

	PHARMACY INTERVENTIONS ON COVID-19	Provided in most (≥80%) pharmacies (Y/N)	Expanded powers granted to pharmacists through amending regulations (Y/N) <i>If Y, please provide link or reference</i>	Remunerated by Government / Payer (Y/N) <i>If Y and available please provide fees and currency</i>	Extra legislation passed by pharmacy regulators in view of covid-19 (Y/N) <i>If Y, please provide link or reference</i>	Other data sources <i>Please provide links or references</i>	OBS
30	Referral pathways of exposed patients to antibody testing for immunity assessment against COVID-19						

31. Were expanded powers granted to pharmacies to perform an already existing pharmacy service? Yes ____ Please explain ____ No ____
32. Were there any new pharmacy services initiated at Government's request or by amending regulation in country? Yes ____ Please explain ____ No ____
33. Were there any emergency temporary closures of pharmacies in country? Yes ____ How many pharmacies? ____ (____ % on total) No ____
34. Were there deaths of pharmacy staff due to COVID-19 in country? Yes ____ How many deaths? ____ No ____

THANK YOU

* Classification and definition of pharmacy intervention categories on COVID-19 based on Cadogan CA, Hughes CM. On the frontline against COVID-19: Community pharmacists' contribution during a public health crisis. Res Soc Adm Pharm 2020; <https://doi.org/10.1016/j.sapharm.2020.03.015>.

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