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Community pharmacist-led medication review procedures across Europe: characterization, implementation and remuneration

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Pharmaceutical Care Network Europe (PCNE) proposed a definition and classification system (type 1, 2a, 2b, 3) for medication review in 2016. However, to date, a description of the implementation and remuneration of such procedures across Europe is lacking.

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The aim of this study was to describe the medication review procedures and the level of implementation and remuneration in community pharmacies across Europe.

Methods

An online survey was developed to characterize medication review procedures (PCNE classification), level of implementation (considering regional or national) and remuneration by a third party. This survey was sent to a purposive sample of three individuals per country, with a working background in community pharmacy, pharmacy practice research, or health policy to ensure reliable data. Data triangulation was used and consensus sought between the responses.

Results

Data were received from 34 out of 44 targeted European countries (November 2016-October 2017) [response rate=77%]. Overall, 55.9% of the countries provided at least one type of medication review as an implemented service or project. Type 1 medication review (based on the medication history) was provided in 13 countries, type 2a (medication history + patient interview) in 14, type 2b (medication

history + clinical data) in two, and type 3 medication review (medication history + patient interview + clinical data) in four countries. Ten of the mentioned services or projects were remunerated by a third-party.

Conclusion

Substantial heterogeneity was observed across Europe in various aspects, including the procedures, implementation level and remuneration obtained. Type 1 and 2a medication review services seem to be more feasible to implement in the community pharmacy than type 2b and 3. A large number of medication review projects were ongoing in community pharmacies, which suggests that new medication review services could become implemented in the coming years.

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Introduction

The role of community pharmacists started to shift from product to patient oriented care since the introduction of pharmaceutical care by Hepler and Strand around 1990.[1] As a result, pharmacist-led cognitive services (PLCS), including medication review, were introduced.[2-6] PLCS are services provided or supervised by a pharmacist, which are based on a standardized and structured procedure, to promote optimal health and medicine therapy and are not necessarily product related. [7] A review of the literature shows that medication review (MR) is one of the most studied and discussed services among PLCS.[3, 8, 9] Numerous reviews and meta-analyses focus on the effectiveness and benefits of MR, whereas studies on the availability and the implementation of MR are scarce.[4, 5, 8-13] In 2011, Bulajeva and colleagues showed that pharmacists in approximately two thirds of 25 investigated European countries (n=16, 64%) provided at least one type of MR in the community setting, nursing home or hospital setting. However, pharmacists in only seven of the 13 countries who provided MR in the community setting charged a payment for the MR procedure.[8] In 2017, the Pharmaceutical Group of European Union (PGEU) stated in their annual report that all community pharmacies in European countries provide chart review (by definition of PGEU, MR type 1) as part of the mandatory dispensing process.[5] In addition, 53% of 30 respondent countries stated to provide MR including structured interviews between pharmacists and patients (PGEU, MR type 2).[5] Both reports provide an overview of the availability of MR across Europe and point towards an increased recognition and importance of MR services. Clinically positive effects of pharmacist-led MR have been reported, with impacts on low-density lipoprotein, blood pressure and medication adherence.[11] Subgroup analysis of clinical MR (type 3) also demonstrated reduced hospitalizations, although with no impact on mortality.[3, 11] Studies have also successfully shown significant cost reduction as a result of decreased healthcare utilization and medication used.[3] Rose et al. investigated the presence of MR in the community pharmacy and in the hospital in an opportunistic sample of 12 different countries (Australia, Austria, Belgium, Bosnia-Herzegovina, Canada, Germany, Japan, Kosovo, Switzerland, the Netherlands, Thailand, USA).[14] Focusing on European countries portrayed in this study, only Austria, Switzerland, and the Netherlands affirmed to have MR available in the community pharmacy, while Belgium, Bosnia-Herzegovina, Germany (projects only), and Kosovo denied the availability of MR in community pharmacies.[14] The absence of a clearly presented definition and classification of MR[14] makes a comparison between studies difficult. The published literature mostly lacks details on the variety of service models, definitions and the understanding of MR.[11, 13-17] This is an important aspect to explore as procedures associated with service delivery may also contribute to understand variability in studies and a possible failure in demonstrating the cost-effectiveness or even cost-benefit of the service.

Contributing to a more universal understanding of the service, Pharmaceutical Care Network Europe (PCNE) presented a definition for medication review (2016) stating: “Medication review is a structured evaluation of a patient‘s medicines with the aim of optimizing medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions.” [18] PCNE also

published a classification for MR according to the information sources available (access to medication history ± patient interview ± clinical data) (Table 1). The classification comprises three levels (simple, intermediate, advanced) of MR and four different types (1, 2a, 2b, 3).[18]

Table 1: PCNE classification of MR with the according sources of information [18]

This definition was complemented with additional specifications: medication review is a structured procedure or a method in patient care, in contrast to the prescription validation or counselling[18], routinely performed in community pharmacies. The PCNE definition only describes the MR as a distinct activity ending with recommending possible interventions. However, all following activities (the interventions, follow-up) are part of the total MR service. Therefore, 'medication review service' is a broader concept than medication review alone, which as such can differ from country to country.[18]

Considering this background and the PCNE definition of MR, we believed the existing literature was insufficiently reflecting the current status of MR services across Europe. Therefore, we aimed at a detailed characterization of the different types of MR services and projects available, the level of implementation and remuneration in community pharmacies, considering the PCNE definition.

Methods

Study design

Between November 2016 and October 2017, a cross-sectional study named PRACTISE (PhaRmAcist-led CogniTIve Services in Europe) was conducted using an online survey consisting of two parts. The part presented here investigated different aspects of MR services, the level of implementation and the remuneration of the service (Additional file 1). Previous results from the overview of the 21 different pharmacist-led cognitive services have already been published.[6]

Sample

The list of all European countries according to the United Nations (n=44)[19], complemented by Armenia, Kosovo, Northern Ireland, Wales, Scotland, Georgia, and Turkey were targeted by the research team. Please note that for better readability, the term "country" is used in this paper for all geographic entities (regions and countries).

For each country, one key representative was identified through the member lists of PCNE, the European Society of Clinical Pharmacy (ESCP), the International Pharmaceutical Federation (FIP), the PGEU and personal contacts from the project team members. The key representatives had either a working background in community pharmacy, pharmacy practice research or health policy. To enable data triangulation, they were asked to suggest two more individuals from their country with different

backgrounds (community pharmacy, pharmacy practice research, and health policy) to complete the set for each country.

Participants were invited to the study by sending an email with an individual link to the online survey tool Findmind® (https://www.findmind.ch/) between November 2016 and October 2017, with a first reminder sent to the potential participants two weeks and a second reminder three weeks after the invitation. In case of lack of response, further potential participants suggested by key representatives were consecutively invited.

Design and content validity of the survey

To ensure uniform understanding of the term "medication review", the PCNE definition and the accompanying classification (Table 1) were provided in the introduction of the online survey.[18] The survey focused on the presence of any type of MR in the home country of the respondent, and the same questions were asked for each type of MR on the characterization of the MR (involved persons, initiation of the MR, source of information, patient eligibility criteria, issues addressed, possible clinical decisions taken, general practitioner (GP) involvement, pharmacist's accreditation), the level of implementation, different aspects of the execution, the service remuneration and relevant published literature.

Services were considered as remunerated, when payment was made by a third-party payer, *e.g*. the government or the health insurance to the pharmacy (or pharmacist), but payment out-of-pocket by the patient was excluded.[20] Besides local and national available implemented services, projects running as a campaign in community pharmacies (except pilot studies/pilot projects) were also considered.

The survey was based on the questionnaire from Bulajeva et al.[8] focusing on MR practices of the different types of MR defined by Clyne et al.[21] (prescription review, adherence and compliance review, clinical medication review) in the community setting, hospital setting, and nursing home setting in Europe. The present survey was restricted to the community pharmacy setting and adapted using comprehensive definitions, additional questions on the implementation level and remuneration of the service (Additional file 1). This survey was then tested for content and face validity in a pilot study with 11 experts in the field of pharmaceutical care from seven different European countries.

In addition, illustrative examples of different MR types were presented as separate statements written by individuals from the respective country (Additional file 3; Box 1-4).

Data consolidation and consensus seeking procedure for the results obtained

After data collection, preliminary analysis by comparing all responses within each country was performed by two researchers (TI & UNM) and discrepancies in responses within the countries were evaluated. A set of "preliminary consensus documents" were prepared containing the discrepant responses (including free text comments) of all participants of a country and a suggestion to the country respondents. The free text was evaluated by two researchers (TI & UNM) and relevant information was

added as specific information to the manuscript *e.g.* the different eligibility criteria and description of the accreditation procedure.

Subsequently, the documents were sent back to the participants for consolidation. In countries with a single participant, the document was sent to a different person from the same country who acted as a validator of the answers obtained from the single survey participant. In the countries with two or three responses, the country-specific preliminary consensus document was resent to the same participants, informing them of the discrepancies identified and requesting further reflection or justification of their answers. The goal was to obtain uniform responses for each country. In case of discrepancy between the answers, official and publicly available documents and published literature were used to validate and consolidate the results.

Data analysis

The Findmind® tool allowed data extraction to Microsoft Excel 2013 for descriptive analysis, performed independently by two researchers (TI & UNM). Three categorical levels were considered for the implementation level, which were defined by the PRACTISE study research team to stratify the quantitative responses obtained: low (1-33%); medium (34-66%); high (67-100%), as described elsewhere.[6]

Results

In 44 of the targeted countries, the research team identified at least one contact. In 34 of these, at least one individual completed the online survey (response rate: 77.3%) (Table 2). No response was received from Armenia, Belarus, Bosnia and Herzegovina, Czech Republic, Italy, Lithuania, Moldova, Russia, Scotland, and Wales. Three responses within a country were achieved from 15 countries, two responses from 12 countries and one response from 7 countries. For five of the seven countries with a single participant, independent validators for data consolidation were recruited, but no validator could be found for Serbia and Georgia. Furthermore, the two participants from France did not consolidate their discrepancies. The survey participants (n=76) and validators (n=8) had a working background in community pharmacy (n= 30; 35.7%), health policy (n=28; 33.3%) or in pharmacy practice research (n=26; 31.0%).

Respondents from 19 out of the 34 countries, reported to provide at least one type of MR (55.9%), either as a national/local service or as a project. (Table 2). In 15 of the 34 countries MRs was not provided as a distinguished structured service or project to patients in community pharmacies (Table 2).

Table 2– Overview of the available MR services and projects across Europe

Detailed description of type 1 MR available in Europe

The survey resulted in 13 countries reporting the existence of type 1 MR based on the medication history. Type 1 MR service in Austria was on a project level and will be implemented nationally in 2019 (Table 3).

Implementation: Table 3 presents the implementation of the type 1 MR service.

Table 3: Type 1 and type 2a MR services and projects – characterization, remuneration and implementation

Remuneration: Remuneration for type 1 MR existed in two of the 13 countries (Germany and Switzerland). In Switzerland, it was paid by the health insurance and in Germany by one specific insurer and the regional chamber of pharmacists. Community pharmacies in Switzerland received remuneration for the nationally implemented service based on a specific remuneration model where the pharmacy receives a specific fee for each prescription and an additional fee for each prescribed product (see Additional file 3 - Box 1). Pharmacies in Germany receive a fixed fee for type 1 MR in the ongoing project. Respondents of the remaining countries reported not getting remuneration for type 1 MR except for Austria and France where the reports were unclear to be able to conclude on this topic.

Workforce and setting: MR services or project could be performed by the pharmacists themselves or in collaboration with pharmacy technicians. In the majority of the countries, pharmacists themselves performed the type 1 MR service (10/13, 76.9 %). No agreement among the respondents about the persons involved in the provision of MR was achieved in France and in Norway. In the Netherlands, in specific pharmacy chains, some activities such as interaction checks and medication reconciliation were transferred to specialized pharmacy technicians. In Finland, MR services were performed by pharmacists (Master's degree, with university education of 300 European Credit Transfer System (ECTS) credits), but also by those having a Bachelor's degree (3 years at university, 180 ECTS credits).[22]

Accreditation: No accreditation was reported as needed for provision of type 1 MR. Participants from Hungary stated to be working on an accreditation program for pharmacists to be implemented in the near future.

Initiation and eligibility criteria of MR: Different people could initiate a type 1 MR (general practitioner (GP), pharmacist, nurse, patient, and caregiver) as well as specific computer software, which served as trigger for a MR (Table 3). In Austria and the Netherlands, computer software triggers the pharmacist to perform a type 1 MR service in patients, using specific clinical rules. Eligibility criteria were only reported for type 1 MR service in Hungary, where a specific document for a patient's health profile is filled according to the national guidelines and topics identified. In five countries (France,

Germany, Slovakia, Switzerland, and the Netherlands), the community pharmacy medication record is updated with the information collected during the MR. In Germany, the information retrieved during the type 1 MR project, an official report form was used to document findings. The collected information could be shared with other health care professionals in France, whereas in the Netherlands this information could be shared through the national electronic patient record.

Information source: For the provision of type 1 MR three different sources of information could be used: prescription medication history, non-prescription medication history, and comprehensive refill data (detailed information related to all medication dispensed from the community pharmacy, *e.g.* date, time, and dispensed quantity).[23] In Austria, England, Finland, Germany, Switzerland, and the Netherlands the medication history for both prescription and non-prescription medication, as well as the comprehensive refill data, were available as an information source. In Croatia, Slovakia, and Ukraine only the medication history of prescription medication was available for type 1 MR.

Issues addressed during MR: "Drug-drug interactions" and "duplications (of therapeutic group or active ingredient)" are relevant issues in all 13 countries providing type 1 MR, whereas "treatment costs" and "treatment durations" were less often looked at (Additional file 2). Some respondents reported further issues checked: *e.g.* "overuse of medication" (Switzerland), "drug-food interactions" and "pharmacogenetics" (the Netherlands).

Inter-professional collaboration: Different ways of information exchange between pharmacists and GPs after the MR was reported, including a report form on findings, an updated medication record, a medication action plan, or a case conference. German pharmacists involved in the current project stated to prepare a report on the findings and a medication action plan to be transferred to the GP. Ukrainian participants stated sending a report form with findings, an updated medication record and a medication action plan to the GP. In all countries the GP makes the clinical decision on solving the detected drug- and patient-related problems. The patient was also involved in clinical decision making in Denmark, Northern Ireland, and the Netherlands.

Detailed description of type 2a MR available in Europe

Type 2a MR service based on the medication history and the patient interview was present in 14 countries across Europe. (Table 2). Polymedication checks in Switzerland and MUR in England are both type 2a MR services focusing on medication use and adherence.

Implementation: Implementation of type 2a varied widely (Table 3). In Sweden it was reported that nearly all community pharmacies could offer type 2a MR services, but in fact, only few did.

Remuneration: In Belgium and in Germany remuneration is only available within specific projects. In all countries where remuneration exists, a fixed price for each performed service is provided ranging

from 30-80 €. In England, remuneration was restricted to a maximum of 400 MURs per pharmacy a year (Additional file 3 - Box 3).

Workforce and setting: Type 2a MR services were exclusively conducted by pharmacists (without the involvement of pharmacy technicians) in all countries. In Finland, individuals with a Bachelor's degree in pharmacy were involved.

Accreditation: Specific accreditation for service provision was required in Denmark, England, Germany, Hungary, Slovenia, and Spain. In Belgium, training and follow up on a voluntarily base was offered for the MR project. No specific accreditation existed in Croatia, Finland, Northern Ireland, Portugal, Switzerland, Sweden, and Ukraine.

Initiation and eligibility criteria of MR: In 10 of the 14 countries providing type 2a MR (71.4 %), both the pharmacist and the patient could initiate the service (Table 3). After the completion of type 2a MR the medication record was updated with the information collected in half of the countries. Pharmacies in Belgium were reported to update the shared medication record linked with other community pharmacies when consent had been obtained from the patient. Six countries (Belgium, Denmark, England, Hungary, Slovenia, and Switzerland) reported using eligibility criteria for patient selection *e.g.* ≥ 5 medications, ≥ 65 years, on high risk medication, recently discharged from hospital, adherence issues, complex dosing regimen, elderly living with homecare or in a nursing home to name a few.

Information sources: Type 2a MR is based on a patient interview and the medication history with prescription and possibly non-prescription medication and/or comprehensive refill data. All above mentioned information sources were used in Belgium, Croatia, Denmark, Finland, Germany, Portugal, and Switzerland. Only the history of prescription, non-prescription medications and the patient interview, but no comprehensive refill data, were reported to be available as informational basis in England, Hungary, Slovenia, and Ukraine. Medication history of prescription medication, comprehensive refill data and patient interview, but no information on non-prescription medication, were available in Spain.

Issues addressed during MR: In half of the countries "drug/treatment cost" is not looked at during the review. Conversely, "adverse drug reaction", "incorrect instructions", "need of drug information", "adherence", and "handling of medication" are issues discussed in all countries (Additional file 2).

Inter-professional collaboration: In all countries, the pharmacists themselves, or together with the patient, decide if the GP receives a report on the findings or an updated medication record. In half of the countries the pharmacist provided a medication action plan to the GP, if necessary. In the Danish project, the pharmacist in collaboration with the patient decided upon the information exchange with the GP. A case conference with the GP was arranged in six countries when deemed necessary by the pharmacist. In all countries, the GP was involved in the final therapy decisions within their area of competence.

Special cases for type 2a MR: In addition to these services, the so-called medication review with follow up exists in Spain. This MR is similar to a type 2a MR, but additional information on specific clinical data measured in the community pharmacy or patient provided medical records are available. Moreover, the medication of the patients is evaluated over a period of time.[24-26]

Detailed description of type 2b MR available in Europe

Respondents from two out of the 34 countries reported to provide type 2b MR based on patients' medication history and clinical data (Finland and Northern Ireland) (Table 2). In Northern Ireland, type 2b MR was reported to be available on a local level, but no detailed description of the service was received. In Finland, this type of MR service was reported to differ from pharmacy to pharmacy.

Implementation and remuneration: Type 2b MR models in Finland were reported to have low implementation (1-33%) and no remuneration by a third party payer.(Table 4).

Table 4: Type 2b and type 3 services and projects – characterization, remuneration and implementation

Workforce and setting: In Finland, type 2b MR was reported in different models depending on the setting and on the patient population (home care, outpatients, hospital) and was performed by individuals with a Bachelor's or Master's in pharmacy.

Accreditation: Different qualifications were needed to provide type 2b MR services. No precondition for accreditation was reported for Finland, although an optional training was offered.

Initiation and eligibility criteria of MR: In Finland, the initiation of type 2b MRs relied on pharmacists, GPs, or nurses (Table 4.)

Information sources: Information accessible to pharmacists in Finland depends on the service model used.

Issues addressed during MR: In Finland, all listed medication- and patient-related issues were covered during MR, except "drug/treatment costs" (Additional file 2).

Inter-professional collaboration: The information exchange on the findings of the MR could be transferred to the GP. The information exchange with GPs was dependent on the pharmacist's opinion in Finland and the model of the service, but a case conference with the GP is always part of the service. No information about GP involvement was received for Northern Ireland.

Special case for type 2b MR:.

In Slovenia and in England, participants reported on the performance of type 2b MR services outside the community pharmacy in GP practices or healthcare centers, if patients could not attend the interview for the type 3 MR service.

Detailed description of type 3 MR available in Europe

Type 3 MR services based on patients' medication history, the patient interview and the clinical data were reported to be available in Austria, Finland, Germany, and the Netherlands (4/34, 11.1%). (Table 2).

Implementation and remuneration: The level of implementation and the remuneration of the type 3 MR services and projects are presented in Table 4.

Workforce and setting: In Austria and Finland, pharmacists were reported to provide MR independently, while in the Netherlands, pharmacy technicians were also part of the service delivery team (*e.g.* logistic support, data collection, medication reconciliation, implementation of agreed outcomes). In type 3 MR project in Germany, GPs were included in the review in alliance with pharmacists.

Accreditation: Type 3 MR service provision requires accreditation in Finland, and the Netherlands. The accreditation process in Finland includes a continuous education course with training lasting 1.5 years (35 ECTS credits).[27] There is no formal accreditation in the Netherlands, although insurance companies demand a specific certificate (obtained following approx. an eight-day course). Pharmacists participating in the project in Germany had to attend a short course (8 hours). No specific accreditation or course was required for type 3 MR service in Austria.

Initiation and eligibility criteria of MR: In all countries the pharmacist or the GP decided on the need for a MR. In addition, patients, caregiver, or nurses could propose MR in Austria, Finland, and the Netherlands (Table 4). Eligibility criteria were mentioned in all countries. In Austria, patients aged over 65 years and taking ≥ five medications were eligible. In Finland, locally agreed eligibility criteria existed, but no national ones. Specific eligibility criteria was reported for the German project: adults insured with a specific company living at home, on > five long-term medications, or with a specific need for the service (*e.g.* non-adherence); agreeing to choose one GP and one pharmacy to care for them continuously. In the Netherlands, the health insurance companies provide specific eligibility criteria, mostly based on age and ≥ five medications with additional criteria such as renal function, cardiovascular or neurological problems and frailty. (see Additional file 3 - Box 4).

Information sources: In Austria, pharmacists reported to have the medication history of prescription and non-prescription medication and access via the patients to laboratory data and clinical conditions. Pharmacists in Finland have access to the history of prescription and non-prescription medication,

comprehensive refill data, information on patients' clinical conditions and the laboratory test results. In the Netherlands, pharmacists used comprehensive refill data, clinical conditions and laboratory test results. In addition, they use the list of over-the-counter (OTC) product sales or they are expected to interview patient about use OTC products. Pharmacists, who participated in the type 3 MR project in Germany had access to the medication history of prescription and non-prescription medication and comprehensive refill data for this MR review, but no access to laboratory test results and clinical conditions. However, in this project pharmacists had a close cooperation with GPs focusing on the clinical information for the conduction of this type 3 MR.

Issues addressed during MR: Most of the proposed drug- and patient-related issues were focused in type 3 MR services; conversely, "drug/treatment costs" were irrelevant in Germany, whereas lifestyle issues were irrelevant in Austria and Germany (Additional file 2).

Inter-professional collaboration: In Austria and Finland the GP was reported to be responsible for final clinical decision making. A triplet consisting of a GP, pharmacist and patient was involved in clinical decision making in Germany and the Netherlands.

Special cases for type 3 MR service: In Slovenia and England clinical pharmacists provide type 3 MR outside the community pharmacy.

In England, the National Health Service (NHS) started to integrate clinical pharmacists (background in hospital or community pharmacy) into GP practices.[28] If the patient is present in the GP practice, these pharmacists perform a type 3 MR service (based on the medication history + patient interview +clinical data), otherwise they perform a type 2b MR. Pharmacists performing the type 2b or type 3 MR in GP practices have to complete a formal training program and demonstrate their clinical competencies. Regarding the remuneration of this service, the NHS service description for clinical pharmacists in GP practices reported on an upfront payment once a year. These clinical pharmacists have access to the full medication history (including prescription/non-prescription medication and comprehensive refill data), laboratory test results and patients' clinical conditions. Moreover, they decide themselves if a GP should be informed about the results of the MR.

In Slovenia, a type 3 MR service was reported to be performed in healthcare centers by a clinical pharmacist (background in community or hospital pharmacy), when the patient cannot attend the interview for the type 3 MR service, they perform a type 2b MR service (see Additional file 3 - Box 3). Only specialized pharmacists in clinical pharmacy (three-years post-graduate course set by the Slovene Chamber of Pharmacies) were allowed to perform this type of MR service. The eligibility criteria for patient selection was broadly written and patients were mainly referred to the pharmacist by the GP. These pharmacists have access to medication history of prescription medication and comprehensive refill data; clinical condition of the patient; laboratory data, but no information on non-prescription medication history. In Slovenia, the GP was informed about the MR performed by a standard issued

report, leading to an updated record and a medication action plan. A case conference with the GP was also organized, if deemed important.

Comparison of the survey responses by the three different working backgrounds and the results after data consolidation

In 12 of the 34 countries, responses from the three different working backgrounds (community pharmacy, pharmacy practice research and health policy) were obtained. Figure 1 presents and compares the responses to the survey question on the existence of each type of MR service according to the three working backgrounds (presented as continuous lines), illustrating the added value of considering complimentary perspectives and the data consolidation process. This figure also highlights the number of MR types reported after the data consolidation process (presented as a dotted line).

Figure 1: Comparison of survey responses by working background and after data consolidation

Discussion

The present study investigated the characteristics of the different types of MR services and projects, the implementation and the remuneration in European community pharmacies. In 19 of the 34 participating countries, at least one type of MR service was provided in community pharmacy, either as a project or as an implemented service. In our study, type 2a MR service was the most widespread, followed by type 1, type 3, and type 2b. Comparing these results to the results from Bulajeva et al.[8], where 13 of the 25 countries provided at least one type of MR in the community setting, a minor increase in the proportion of countries could be observed over 5 years. Nevertheless, different classifications of the MR type were adopted in these two studies and a distinct set of countries, which is likely to influence the results.[8] Besides the reported 20 locally or nationally implemented MR services, 13 projects on MR are currently ongoing in the investigated European countries, suggesting potential expansion of MR services across Europe.

Implementation variability suggests that reporting the existence of a service in a country does not therefore automatically mean the service is regularly provided to the country's population.

The results of this survey are not only an upgrade of a prior survey conducted in 2011 by Anna Bulajeva et al.[8], but provide an additional focus on service implementation and remuneration, while using comprehensive definitions based on the PCNE classification of MR (type 1, 2a, 2b, 3). It is important to say that the participants in this survey received clear information on different types of MR and the difference between "prescription validation and counselling" versus "medication review", same as the

difference between "medication review" as a standalone activity, versus the "medication review service" based on the activity of MR including other activities.

Type 1 MR service was provided in 38.2% of the participating countries, whereas the PGEU stated that type 1 MR is provided by 100% of the European pharmacies as this is part of the routine dispensing process.[5] This discrepancy can be explained mainly by the different definitions adopted. In the present survey, it was clearly stated that type 1 MR is not equal to the ad hoc prescription validation and counselling during the dispensing of prescribed medication and that the major difference relies in the structured procedure of a MR in contrast to ex tempore counselling.[18]

Type 2a MR is the most prevalent service according to our results with 41.2% of the countries reporting to offer type 2a MR services in their countries, either as an implemented service or ongoing project, in line with the survey from Bulajeva et al.[8] This suggests that the MR using the medication history and a patient interview as sources of information is more feasible to perform in the community pharmacy.

Type 2b and type 3 MR are less prevalent in European community pharmacies. These services may however be available on different levels and in different settings (*e.g.* hospitals or general practices).[10, 28] The provision of such services implies a comprehensive appraisal of clinical data. In Slovenia and England, clinical pharmacists perform MR type 2b and 3 within GP practices or in healthcare centers where clinical conditions and laboratory test results are available, while in the Netherlands and Finland the community pharmacies have access to the clinical information. These services are only available for few patients and the performance of these services is limited to specifically trained pharmacists in these countries. Training in clinical and other skills was identified as a facilitator for service implementation.[29] In the future, e-health initiatives might ease the access to clinical data for all healthcare providers and thereby also facilitate provision of type 2b and 3 MR services in the community pharmacy setting.[29, 30]

Implementation of MR services still poses a major challenge. In countries with medium or high implementation such as the Netherlands, England, Finland and Switzerland, the services were nationally initiated a few years ago, which indicates that large-scale implementation is time consuming. Moreover, the level of implementation of the service could be influenced by different factors: *e.g.* service reimbursement[29] or commissioning, the time span since service initiation, local or nation wide initiative, training and education. The majority of the MR services with medium or high implementation were remunerated by the government or health insurance. A study focusing on clinical MR in cardiovascular patients in the Netherlands concluded that lack of reimbursement and high time demands to perform the MR were the main reasons for service unsustainability.[31] Our data suggests reimbursement may be partly accountable for facilitated implementation. The Netherlands has a high level of implementation of MR services (~100% for type 1 and type 3 MR services), because Dutch pharmacies are obliged to provide type 1 MRs and the inspectorate also monitors the performance of type 3 MR. Previous Dutch studies have also shown that MR reduces drug-related problems and hence improve the quality of drug therapy[32, 33], factors that may also lead to higher service uptake. MRs have also proven to improve blood pressure

control, low-density lipoprotein, medication adherence, and contribute to reduced healthcare costs.[11] This evidence of impact on outcomes is likely to influence stakeholders' perspectives and willingness to cooperate and contribute to wider dissemination.[11] Behavior change in proactive service provision is likely to be feasible, but challenges at different levels (personal, team, institution, wider environment) need to be overcome.[34]

Remuneration for MR services is available in 10 out of the 19 countries, where respondents reported to provide MR by a third-party payer. Comparing remuneration with other pharmacist-led cognitive services, MR services were the most frequently remunerated.[6] Looking into details in the current study reveals that only 15.4% (2/13) of the provided type 1 MR services were remunerated, compared to 35.7% (5/14) in type 2a, and 75.0% (3/4) in type 3 MR services, whereas the type 2b MR in Finland is not remunerated by a third-party payer. This difference is plausible since human and financial resources needed to perform a type 3 MR review are far higher than those for type 1 MR. Community pharmacies offering MR services without remuneration might provide the service at their own cost or require the patient to bare the cost. This situation and the low rates of remuneration of structured pharmacy services are unsatisfactory and call for action.

Eligibility criteria exist in several countries, especially for types 2a, 2b and type 3 MR service (*e.g.* ≥ 5 medications, ≥ 65 years, living in a homecare or nursing home, high risk medication, recent hospital discharge etc.). These criteria are similar to those previously reported in the literature.[20, 35-38] However, a large number of countries have no specific criteria for patient selection and pharmacists themselves take the decision to select patients based on a perceived clinical need.

Data triangulation was used to collect representative information from different stakeholders. Even if this comprehensive approach was only partially successful, complete data in 12 countries revealed interesting heterogeneity among responses. These experiences should be respected when other pan-European surveys are planned.

Strengths and limitations

The present survey completed in October 2017 included participants with different backgrounds (community pharmacy, pharmacy practice research or in health policy) aiming to increase data credibility. Nonetheless, the strategy used to reach further participants through a key representative could potentially lead to selection bias. It should be noted, however, that our study reflects the situation in 2016-2017 and may have changed between then and the date of this publication. The process of data consolidation was very time consuming and leading to a delay in making final results available.

It is essential to consider that MR is a complex pharmaceutical intervention with different types of MR and variable issues to be addressed, strongly dependent on multiple factors such as legal frameworks and the context, where the service is provided within the countries.[39] Theses differences represent a challenge when trying to standardize concepts. Even though the multinational research team had a wide

network across Europe, not all European countries were reached, despite intense attempts. Consequently, there is still some uncertainty regarding the responses, especially from Georgia, Serbia and France. The type 1 MR service based on the medication history was difficult to distinguish from daily community pharmacy practice, particularly in two countries (England, Sweden), despite having stated that type 1 MR service is more than just the daily dispensing and counselling routine. Because fees for national services may be confidential data in some countries, it was avoided to report country specific fees for MR services.

Conclusion

Our overview of the provided community pharmacist-led MR services in Europe in 2016 and 2017 presents detailed information on specific service characteristics and enables an insight into a wide pattern of MR services available in Europe. There is large heterogeneity across Europe in all aspects, the characteristics of the services, the implementation and the remuneration. Moreover, complexity of the MR type seems to be associated with remuneration. Types 1 and 2a MR services were more frequently provided, suggesting they may be more feasible to implement in community pharmacy. Although no major development over the last few years could be observed, the large number of ongoing projects on MRs in community pharmacies suggests that new MR services could become implemented in Europe in the coming years. The comprehensive information provided in this paper could help researchers, representative associations and policy makers to reengineer current services or to establish new ones.

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Ethics approval

The Ethical approval for the PRACTISE study was obtained from “Comissão de Ética Egas Moniz” on 26th October 2016 (Proc. Number 515).

Figure legends

Figure 1 legend: Figure 1: Comparison of survey responses by working the three different working background and after data consolidation n=12 (Croatia, Estonia, Finland, Germany, Hungary, Iceland, Malta, Portugal, Slovakia, Slovenia, Switzerland, Turkey)

Table legends

Table 1 legend: Table 1. PCNE classification of MR with the according sources of information[17]

Table 2 legend: Table2. Overview of the available MR services and projects across Europe

Table 3 legend: Table 3. Type 1 and type 2a MR services and projects – characterization, remuneration and implementation

Table 4 legend: Table 4. Type 2b and type 3 MR services and projects – characterization, remuneration and implementation

Additional files

Additional file 1: Survey used to evaluate the different types of MR available in each country, extracted from Findmind Tool ®.

Additional file 2: Medication- and patient- related issues during MR

Additional file 3: Illustrative examples of different types of MR (Switzerland, England, Slovenia, the Netherlands)

Title:

Community pharmacist-led medication review procedures across Europe: characterization, implementation and remuneration

Abstract

Background

Pharmaceutical Care Network Europe (PCNE) proposed a definition and classification system (type 1, 2a, 2b, 3) for medication review in 2016. However, to date, a description of the implementation and remuneration of such procedures across Europe is lacking.

Objective

The aim of this study was to describe the medication review procedures and the level of implementation and remuneration in community pharmacies across Europe.

Methods

An online survey was developed to characterize medication review procedures (PCNE classification), level of implementation (considering regional or national) and remuneration by a third party. This survey was sent to a purposive sample of three individuals per country, with a working background in community pharmacy, pharmacy practice research, or health policy to ensure reliable data. Data triangulation was used and consensus sought between the responses.

Results

Data were received from 34 out of 44 targeted European countries (November 2016-October 2017) [response rate=77%]. Overall, 55.9% of the countries provided at least one type of medication review as an implemented service or project. Type 1 medication review (based on the medication history) was

provided in 13 countries, type 2a (medication history + patient interview) in 14, type 2b (medication history + clinical data) in two, and type 3 medication review (medication history + patient interview + clinical data) in four countries. Ten of the mentioned services or projects were remunerated by a third-party.

Conclusion

Substantial heterogeneity was observed across Europe in various aspects, including the procedures, implementation level and remuneration obtained. Type 1 and 2a medication review services seem to be more feasible to implement in the community pharmacy than type 2b and 3. A large number of medication review projects were ongoing in community pharmacies, which suggests that new medication review services could become implemented in the coming years.

Keywords: medication review, community pharmacy services, primary health care, service implementation, remuneration, Europe

Introduction

The role of community pharmacists started to shift from product to patient oriented care since the introduction of pharmaceutical care by Hepler and Strand around 1990.[1] As a result, pharmacist-led cognitive services (PLCS), including medication review, were introduced.[2-6] PLCS are services provided or supervised by a pharmacist, which are based on a standardized and structured procedure, to promote optimal health and medicine therapy and are not necessarily product related. [7] A review of the literature shows that medication review (MR) is one of the most studied and discussed services among PLCS.[3, 8, 9] Numerous reviews and meta-analyses focus on the effectiveness and benefits of MR, whereas studies on the availability and the implementation of MR are scarce.[4, 5, 8-13] In 2011, Bulajeva and colleagues showed that pharmacists in approximately two thirds of 25 investigated European countries (n=16, 64%) provided at least one type of MR in the community setting, nursing home or hospital setting. However, pharmacists in only seven of the 13 countries who provided MR in the community setting charged a payment for the MR procedure.[8] In 2017, the Pharmaceutical Group of European Union (PGEU) stated in their annual report that all community pharmacies in European countries provide chart review (by definition of PGEU, MR type 1) as part of the mandatory dispensing process.[5] In addition, 53% of 30 respondent countries stated to provide MR including structured interviews between pharmacists and patients (PGEU, MR type 2).[5] Both reports provide an overview of the availability of MR across Europe and point towards an increased recognition and importance of MR services. Clinically positive effects of pharmacist-led MR have been reported, with impacts on low-density lipoprotein, blood pressure and medication adherence.[11] Subgroup analysis of clinical MR (type 3) also demonstrated reduced hospitalizations, although with no impact on mortality.[3, 11] Studies have also successfully shown significant cost reduction as a result of decreased healthcare utilization and medication used.[3] Rose et al. investigated the presence of MR in the community pharmacy and in the hospital in an opportunistic sample of 12 different countries (Australia, Austria, Belgium, Bosnia-Herzegovina, Canada, Germany, Japan, Kosovo, Switzerland, the Netherlands, Thailand, USA).[14] Focusing on European countries portrayed in this study, only Austria, Switzerland, and the Netherlands affirmed to have MR available in the community pharmacy, while Belgium, Bosnia-Herzegovina, Germany (projects only), and Kosovo denied the availability of MR in community pharmacies.[14] The absence of a clearly presented definition and classification of MR[14] makes a comparison between studies difficult. The published literature mostly lacks details on the variety of service models, definitions and the understanding of MR.[11, 13-17] This is an important aspect to explore as procedures associated with service delivery may also contribute to understand variability in studies and a possible failure in demonstrating the cost-effectiveness or even cost-benefit of the service.

Contributing to a more universal understanding of the service, Pharmaceutical Care Network Europe (PCNE) presented a definition for medication review (2016) stating: “Medication review is a structured evaluation of a patient‘s medicines with the aim of optimizing medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions.” [18] PCNE also

published a classification for MR according to the information sources available (access to medication history ± patient interview ± clinical data) (Table 1). The classification comprises three levels (simple, intermediate, advanced) of MR and four different types (1, 2a, 2b, 3).[18]

Table 1: PCNE classification of MR with the according sources of information [18]

This definition was complemented with additional specifications: medication review is a structured procedure or a method in patient care, in contrast to the prescription validation or counselling[18], routinely performed in community pharmacies. The PCNE definition only describes the MR as a distinct activity ending with recommending possible interventions. However, all following activities (the interventions, follow-up) are part of the total MR service. Therefore, 'medication review service' is a broader concept than medication review alone, which as such can differ from country to country.[18]

Considering this background and the PCNE definition of MR, we believed the existing literature was insufficiently reflecting the current status of MR services across Europe. Therefore, we aimed at a detailed characterization of the different types of MR services and projects available, the level of implementation and remuneration in community pharmacies, considering the PCNE definition.

Methods

Study design

Between November 2016 and October 2017, a cross-sectional study named PRACTISE (PhaRmAcist-led CogniTIve Services in Europe) was conducted using an online survey consisting of two parts. The part presented here investigated different aspects of MR services, the level of implementation and the remuneration of the service (Additional file 1). Previous results from the overview of the 21 different pharmacist-led cognitive services have already been published.[6]

Sample

The list of all European countries according to the United Nations (n=44)[19], complemented by Armenia, Kosovo, Northern Ireland, Wales, Scotland, Georgia, and Turkey were targeted by the research team. Please note that for better readability, the term "country" is used in this paper for all geographic entities (regions and countries).

For each country, one key representative was identified through the member lists of PCNE, the European Society of Clinical Pharmacy (ESCP), the International Pharmaceutical Federation (FIP), the PGEU and personal contacts from the project team members. The key representatives had either a working background in community pharmacy, pharmacy practice research or health policy. To enable data triangulation, they were asked to suggest two more individuals from their country with different

backgrounds (community pharmacy, pharmacy practice research, and health policy) to complete the set for each country.

Participants were invited to the study by sending an email with an individual link to the online survey tool Findmind® (https://www.findmind.ch/) between November 2016 and October 2017, with a first reminder sent to the potential participants two weeks and a second reminder three weeks after the invitation. In case of lack of response, further potential participants suggested by key representatives were consecutively invited.

Design and content validity of the survey

To ensure uniform understanding of the term "medication review", the PCNE definition and the accompanying classification (Table 1) were provided in the introduction of the online survey.[18] The survey focused on the presence of any type of MR in the home country of the respondent, and the same questions were asked for each type of MR on the characterization of the MR (involved persons, initiation of the MR, source of information, patient eligibility criteria, issues addressed, possible clinical decisions taken, general practitioner (GP) involvement, pharmacist's accreditation), the level of implementation, different aspects of the execution, the service remuneration and relevant published literature.

Services were considered as remunerated, when payment was made by a third-party payer, *e.g*. the government or the health insurance to the pharmacy (or pharmacist), but payment out-of-pocket by the patient was excluded.[20] Besides local and national available implemented services, projects running as a campaign in community pharmacies (except pilot studies/pilot projects) were also considered.

The survey was based on the questionnaire from Bulajeva et al.[8] focusing on MR practices of the different types of MR defined by Clyne et al.[21] (prescription review, adherence and compliance review, clinical medication review) in the community setting, hospital setting, and nursing home setting in Europe. The present survey was restricted to the community pharmacy setting and adapted using comprehensive definitions, additional questions on the implementation level and remuneration of the service (Additional file 1). This survey was then tested for content and face validity in a pilot study with 11 experts in the field of pharmaceutical care from seven different European countries.

In addition, illustrative examples of different MR types were presented as separate statements written by individuals from the respective country (Additional file 3; Box 1-4).

Data consolidation and consensus seeking procedure for the results obtained

After data collection, preliminary analysis by comparing all responses within each country was performed by two researchers (TI & UNM) and discrepancies in responses within the countries were evaluated. A set of "preliminary consensus documents" were prepared containing the discrepant responses (including free text comments) of all participants of a country and a suggestion to the country respondents. The free text was evaluated by two researchers (TI & UNM) and relevant information was

added as specific information to the manuscript *e.g.* the different eligibility criteria and description of the accreditation procedure.

Subsequently, the documents were sent back to the participants for consolidation. In countries with a single participant, the document was sent to a different person from the same country who acted as a validator of the answers obtained from the single survey participant. In the countries with two or three responses, the country-specific preliminary consensus document was resent to the same participants, informing them of the discrepancies identified and requesting further reflection or justification of their answers. The goal was to obtain uniform responses for each country. In case of discrepancy between the answers, official and publicly available documents and published literature were used to validate and consolidate the results.

Data analysis

The Findmind® tool allowed data extraction to Microsoft Excel 2013 for descriptive analysis, performed independently by two researchers (TI & UNM). Three categorical levels were considered for the implementation level, which were defined by the PRACTISE study research team to stratify the quantitative responses obtained: low (1-33%); medium (34-66%); high (67-100%), as described elsewhere.[6]

Results

In 44 of the targeted countries, the research team identified at least one contact. In 34 of these, at least one individual completed the online survey (response rate: 77.3%) (Table 2). No response was received from Armenia, Belarus, Bosnia and Herzegovina, Czech Republic, Italy, Lithuania, Moldova, Russia, Scotland, and Wales. Three responses within a country were achieved from 15 countries, two responses from 12 countries and one response from 7 countries. For five of the seven countries with a single participant, independent validators for data consolidation were recruited, but no validator could be found for Serbia and Georgia. Furthermore, the two participants from France did not consolidate their discrepancies. The survey participants (n=76) and validators (n=8) had a working background in community pharmacy (n= 30; 35.7%), health policy (n=28; 33.3%) or in pharmacy practice research (n=26; 31.0%).

Respondents from 19 out of the 34 countries, reported to provide at least one type of MR (55.9%), either as a national/local service or as a project. (Table 2). In 15 of the 34 countries MRs was not provided as a distinguished structured service or project to patients in community pharmacies (Table 2).

Table 2– Overview of the available MR services and projects across Europe

Detailed description of type 1 MR available in Europe

The survey resulted in 13 countries reporting the existence of type 1 MR based on the medication history. Type 1 MR service in Austria was on a project level and will be implemented nationally in 2019 (Table 3).

Implementation: Table 3 presents the implementation of the type 1 MR service.

Table 3: Type 1 and type 2a MR services and projects – characterization, remuneration and implementation

Remuneration: Remuneration for type 1 MR existed in two of the 13 countries (Germany and Switzerland). In Switzerland, it was paid by the health insurance and in Germany by one specific insurer and the regional chamber of pharmacists. Community pharmacies in Switzerland received remuneration for the nationally implemented service based on a specific remuneration model where the pharmacy receives a specific fee for each prescription and an additional fee for each prescribed product (see Additional file 3 - Box 1). Pharmacies in Germany receive a fixed fee for type 1 MR in the ongoing project. Respondents of the remaining countries reported not getting remuneration for type 1 MR except for Austria and France where the reports were unclear to be able to conclude on this topic.

Workforce and setting: MR services or project could be performed by the pharmacists themselves or in collaboration with pharmacy technicians. In the majority of the countries, pharmacists themselves performed the type 1 MR service (10/13, 76.9 %). No agreement among the respondents about the persons involved in the provision of MR was achieved in France and in Norway. In the Netherlands, in specific pharmacy chains, some activities such as interaction checks and medication reconciliation were transferred to specialized pharmacy technicians. In Finland, MR services were performed by pharmacists (Master's degree, with university education of 300 European Credit Transfer System (ECTS) credits), but also by those having a Bachelor's degree (3 years at university, 180 ECTS credits).[22]

Accreditation: No accreditation was reported as needed for provision of type 1 MR. Participants from Hungary stated to be working on an accreditation program for pharmacists to be implemented in the near future.

Initiation and eligibility criteria of MR: Different people could initiate a type 1 MR (general practitioner (GP), pharmacist, nurse, patient, and caregiver) as well as specific computer software, which served as trigger for a MR (Table 3). In Austria and the Netherlands, computer software triggers the pharmacist to perform a type 1 MR service in patients, using specific clinical rules. Eligibility criteria were only reported for type 1 MR service in Hungary, where a specific document for a patient's health profile is filled according to the national guidelines and topics identified. In five countries (France,

Germany, Slovakia, Switzerland, and the Netherlands), the community pharmacy medication record is updated with the information collected during the MR. In Germany, the information retrieved during the type 1 MR project, an official report form was used to document findings. The collected information could be shared with other health care professionals in France, whereas in the Netherlands this information could be shared through the national electronic patient record.

Information source: For the provision of type 1 MR three different sources of information could be used: prescription medication history, non-prescription medication history, and comprehensive refill data (detailed information related to all medication dispensed from the community pharmacy, *e.g.* date, time, and dispensed quantity).[23] In Austria, England, Finland, Germany, Switzerland, and the Netherlands the medication history for both prescription and non-prescription medication, as well as the comprehensive refill data, were available as an information source. In Croatia, Slovakia, and Ukraine only the medication history of prescription medication was available for type 1 MR.

Issues addressed during MR: "Drug-drug interactions" and "duplications (of therapeutic group or active ingredient)" are relevant issues in all 13 countries providing type 1 MR, whereas "treatment costs" and "treatment durations" were less often looked at (Additional file 2). Some respondents reported further issues checked: *e.g.* "overuse of medication" (Switzerland), "drug-food interactions" and "pharmacogenetics" (the Netherlands).

Inter-professional collaboration: Different ways of information exchange between pharmacists and GPs after the MR was reported, including a report form on findings, an updated medication record, a medication action plan, or a case conference. German pharmacists involved in the current project stated to prepare a report on the findings and a medication action plan to be transferred to the GP. Ukrainian participants stated sending a report form with findings, an updated medication record and a medication action plan to the GP. In all countries the GP makes the clinical decision on solving the detected drug- and patient-related problems. The patient was also involved in clinical decision making in Denmark, Northern Ireland, and the Netherlands.

Detailed description of type 2a MR available in Europe

Type 2a MR service based on the medication history and the patient interview was present in 14 countries across Europe. (Table 2). Polymedication checks in Switzerland and MUR in England are both type 2a MR services focusing on medication use and adherence.

Implementation: Implementation of type 2a varied widely (Table 3). In Sweden it was reported that nearly all community pharmacies could offer type 2a MR services, but in fact, only few did.

Remuneration: In Belgium and in Germany remuneration is only available within specific projects. In all countries where remuneration exists, a fixed price for each performed service is provided ranging

from 30-80 €. In England, remuneration was restricted to a maximum of 400 MURs per pharmacy a year (Additional file 3 - Box 3).

Workforce and setting: Type 2a MR services were exclusively conducted by pharmacists (without the involvement of pharmacy technicians) in all countries. In Finland, individuals with a Bachelor's degree in pharmacy were involved.

Accreditation: Specific accreditation for service provision was required in Denmark, England, Germany, Hungary, Slovenia, and Spain. In Belgium, training and follow up on a voluntarily base was offered for the MR project. No specific accreditation existed in Croatia, Finland, Northern Ireland, Portugal, Switzerland, Sweden, and Ukraine.

Initiation and eligibility criteria of MR: In 10 of the 14 countries providing type 2a MR (71.4 %), both the pharmacist and the patient could initiate the service (Table 3). After the completion of type 2a MR the medication record was updated with the information collected in half of the countries. Pharmacies in Belgium were reported to update the shared medication record linked with other community pharmacies when consent had been obtained from the patient. Six countries (Belgium, Denmark, England, Hungary, Slovenia, and Switzerland) reported using eligibility criteria for patient selection *e.g.* ≥ 5 medications, ≥ 65 years, on high risk medication, recently discharged from hospital, adherence issues, complex dosing regimen, elderly living with homecare or in a nursing home to name a few.

Information sources: Type 2a MR is based on a patient interview and the medication history with prescription and possibly non-prescription medication and/or comprehensive refill data. All above mentioned information sources were used in Belgium, Croatia, Denmark, Finland, Germany, Portugal, and Switzerland. Only the history of prescription, non-prescription medications and the patient interview, but no comprehensive refill data, were reported to be available as informational basis in England, Hungary, Slovenia, and Ukraine. Medication history of prescription medication, comprehensive refill data and patient interview, but no information on non-prescription medication, were available in Spain.

Issues addressed during MR: In half of the countries "drug/treatment cost" is not looked at during the review. Conversely, "adverse drug reaction", "incorrect instructions", "need of drug information", "adherence", and "handling of medication" are issues discussed in all countries (Additional file 2).

Inter-professional collaboration: In all countries, the pharmacists themselves, or together with the patient, decide if the GP receives a report on the findings or an updated medication record. In half of the countries the pharmacist provided a medication action plan to the GP, if necessary. In the Danish project, the pharmacist in collaboration with the patient decided upon the information exchange with the GP. A case conference with the GP was arranged in six countries when deemed necessary by the pharmacist. In all countries, the GP was involved in the final therapy decisions within their area of competence.

Special cases for type 2a MR: In addition to these services, the so-called medication review with follow up exists in Spain. This MR is similar to a type 2a MR, but additional information on specific clinical data measured in the community pharmacy or patient provided medical records are available. Moreover, the medication of the patients is evaluated over a period of time.[24-26]

Detailed description of type 2b MR available in Europe

Respondents from two out of the 34 countries reported to provide type 2b MR based on patients' medication history and clinical data (Finland and Northern Ireland) (Table 2). In Northern Ireland, type 2b MR was reported to be available on a local level, but no detailed description of the service was received. In Finland, this type of MR service was reported to differ from pharmacy to pharmacy.

Implementation and remuneration: Type 2b MR models in Finland were reported to have low implementation (1-33%) and no remuneration by a third party payer.(Table 4).

Table 4: Type 2b and type 3 services and projects – characterization, remuneration and implementation

Workforce and setting: In Finland, type 2b MR was reported in different models depending on the setting and on the patient population (home care, outpatients, hospital) and was performed by individuals with a Bachelor's or Master's in pharmacy.

Accreditation: Different qualifications were needed to provide type 2b MR services. No precondition for accreditation was reported for Finland, although an optional training was offered.

Initiation and eligibility criteria of MR: In Finland, the initiation of type 2b MRs relied on pharmacists, GPs, or nurses (Table 4.)

Information sources: Information accessible to pharmacists in Finland depends on the service model used.

Issues addressed during MR: In Finland, all listed medication- and patient-related issues were covered during MR, except "drug/treatment costs" (Additional file 2).

Inter-professional collaboration: The information exchange on the findings of the MR could be transferred to the GP. The information exchange with GPs was dependent on the pharmacist's opinion in Finland and the model of the service, but a case conference with the GP is always part of the service. No information about GP involvement was received for Northern Ireland.

Special case for type 2b MR:.

In Slovenia and in England, participants reported on the performance of type 2b MR services outside the community pharmacy in GP practices or healthcare centers, if patients could not attend the interview for the type 3 MR service.

Detailed description of type 3 MR available in Europe

Type 3 MR services based on patients' medication history, the patient interview and the clinical data were reported to be available in Austria, Finland, Germany, and the Netherlands (4/34, 11.1%). (Table 2).

Implementation and remuneration: The level of implementation and the remuneration of the type 3 MR services and projects are presented in Table 4.

Workforce and setting: In Austria and Finland, pharmacists were reported to provide MR independently, while in the Netherlands, pharmacy technicians were also part of the service delivery team (*e.g.* logistic support, data collection, medication reconciliation, implementation of agreed outcomes). In type 3 MR project in Germany, GPs were included in the review in alliance with pharmacists.

Accreditation: Type 3 MR service provision requires accreditation in Finland, and the Netherlands. The accreditation process in Finland includes a continuous education course with training lasting 1.5 years (35 ECTS credits).[27] There is no formal accreditation in the Netherlands, although insurance companies demand a specific certificate (obtained following approx. an eight-day course). Pharmacists participating in the project in Germany had to attend a short course (8 hours). No specific accreditation or course was required for type 3 MR service in Austria.

Initiation and eligibility criteria of MR: In all countries the pharmacist or the GP decided on the need for a MR. In addition, patients, caregiver, or nurses could propose MR in Austria, Finland, and the Netherlands (Table 4). Eligibility criteria were mentioned in all countries. In Austria, patients aged over 65 years and taking ≥ five medications were eligible. In Finland, locally agreed eligibility criteria existed, but no national ones. Specific eligibility criteria was reported for the German project: adults insured with a specific company living at home, on > five long-term medications, or with a specific need for the service (*e.g.* non-adherence); agreeing to choose one GP and one pharmacy to care for them continuously. In the Netherlands, the health insurance companies provide specific eligibility criteria, mostly based on age and ≥ five medications with additional criteria such as renal function, cardiovascular or neurological problems and frailty. (see Additional file 3 - Box 4).

Information sources: In Austria, pharmacists reported to have the medication history of prescription and non-prescription medication and access via the patients to laboratory data and clinical conditions. Pharmacists in Finland have access to the history of prescription and non-prescription medication,

comprehensive refill data, information on patients' clinical conditions and the laboratory test results. In the Netherlands, pharmacists used comprehensive refill data, clinical conditions and laboratory test results. In addition, they use the list of over-the-counter (OTC) product sales or they are expected to interview patient about use OTC products. Pharmacists, who participated in the type 3 MR project in Germany had access to the medication history of prescription and non-prescription medication and comprehensive refill data for this MR review, but no access to laboratory test results and clinical conditions. However, in this project pharmacists had a close cooperation with GPs focusing on the clinical information for the conduction of this type 3 MR.

Issues addressed during MR: Most of the proposed drug- and patient-related issues were focused in type 3 MR services; conversely, "drug/treatment costs" were irrelevant in Germany, whereas lifestyle issues were irrelevant in Austria and Germany (Additional file 2).

Inter-professional collaboration: In Austria and Finland the GP was reported to be responsible for final clinical decision making. A triplet consisting of a GP, pharmacist and patient was involved in clinical decision making in Germany and the Netherlands.

Special cases for type 3 MR service: In Slovenia and England clinical pharmacists provide type 3 MR outside the community pharmacy.

In England, the National Health Service (NHS) started to integrate clinical pharmacists (background in hospital or community pharmacy) into GP practices.[28] If the patient is present in the GP practice, these pharmacists perform a type 3 MR service (based on the medication history + patient interview +clinical data), otherwise they perform a type 2b MR. Pharmacists performing the type 2b or type 3 MR in GP practices have to complete a formal training program and demonstrate their clinical competencies. Regarding the remuneration of this service, the NHS service description for clinical pharmacists in GP practices reported on an upfront payment once a year. These clinical pharmacists have access to the full medication history (including prescription/non-prescription medication and comprehensive refill data), laboratory test results and patients' clinical conditions. Moreover, they decide themselves if a GP should be informed about the results of the MR.

In Slovenia, a type 3 MR service was reported to be performed in healthcare centers by a clinical pharmacist (background in community or hospital pharmacy), when the patient cannot attend the interview for the type 3 MR service, they perform a type 2b MR service (see Additional file 3 - Box 3). Only specialized pharmacists in clinical pharmacy (three-years post-graduate course set by the Slovene Chamber of Pharmacies) were allowed to perform this type of MR service. The eligibility criteria for patient selection was broadly written and patients were mainly referred to the pharmacist by the GP. These pharmacists have access to medication history of prescription medication and comprehensive refill data; clinical condition of the patient; laboratory data, but no information on non-prescription medication history. In Slovenia, the GP was informed about the MR performed by a standard issued

report, leading to an updated record and a medication action plan. A case conference with the GP was also organized, if deemed important.

Comparison of the survey responses by the three different working backgrounds and the results after data consolidation

In 12 of the 34 countries, responses from the three different working backgrounds (community pharmacy, pharmacy practice research and health policy) were obtained. Figure 1 presents and compares the responses to the survey question on the existence of each type of MR service according to the three working backgrounds (presented as continuous lines), illustrating the added value of considering complimentary perspectives and the data consolidation process. This figure also highlights the number of MR types reported after the data consolidation process (presented as a dotted line).

Figure 1: Comparison of survey responses by working background and after data consolidation

Discussion

The present study investigated the characteristics of the different types of MR services and projects, the implementation and the remuneration in European community pharmacies. In 19 of the 34 participating countries, at least one type of MR service was provided in community pharmacy, either as a project or as an implemented service. In our study, type 2a MR service was the most widespread, followed by type 1, type 3, and type 2b. Comparing these results to the results from Bulajeva et al.[8], where 13 of the 25 countries provided at least one type of MR in the community setting, a minor increase in the proportion of countries could be observed over 5 years. Nevertheless, different classifications of the MR type were adopted in these two studies and a distinct set of countries, which is likely to influence the results.[8] Besides the reported 20 locally or nationally implemented MR services, 13 projects on MR are currently ongoing in the investigated European countries, suggesting potential expansion of MR services across Europe.

Implementation variability suggests that reporting the existence of a service in a country does not therefore automatically mean the service is regularly provided to the country's population.

The results of this survey are not only an upgrade of a prior survey conducted in 2011 by Anna Bulajeva et al.[8], but provide an additional focus on service implementation and remuneration, while using comprehensive definitions based on the PCNE classification of MR (type 1, 2a, 2b, 3). It is important to say that the participants in this survey received clear information on different types of MR and the difference between "prescription validation and counselling" versus "medication review", same as the

difference between "medication review" as a standalone activity, versus the "medication review service" based on the activity of MR including other activities.

Type 1 MR service was provided in 38.2% of the participating countries, whereas the PGEU stated that type 1 MR is provided by 100% of the European pharmacies as this is part of the routine dispensing process.[5] This discrepancy can be explained mainly by the different definitions adopted. In the present survey, it was clearly stated that type 1 MR is not equal to the ad hoc prescription validation and counselling during the dispensing of prescribed medication and that the major difference relies in the structured procedure of a MR in contrast to ex tempore counselling.[18]

Type 2a MR is the most prevalent service according to our results with 41.2% of the countries reporting to offer type 2a MR services in their countries, either as an implemented service or ongoing project, in line with the survey from Bulajeva et al.[8] This suggests that the MR using the medication history and a patient interview as sources of information is more feasible to perform in the community pharmacy.

Type 2b and type 3 MR are less prevalent in European community pharmacies. These services may however be available on different levels and in different settings (*e.g.* hospitals or general practices).[10, 28] The provision of such services implies a comprehensive appraisal of clinical data. In Slovenia and England, clinical pharmacists perform MR type 2b and 3 within GP practices or in healthcare centers where clinical conditions and laboratory test results are available, while in the Netherlands and Finland the community pharmacies have access to the clinical information. These services are only available for few patients and the performance of these services is limited to specifically trained pharmacists in these countries. Training in clinical and other skills was identified as a facilitator for service implementation.[29] In the future, e-health initiatives might ease the access to clinical data for all healthcare providers and thereby also facilitate provision of type 2b and 3 MR services in the community pharmacy setting.[29, 30]

Implementation of MR services still poses a major challenge. In countries with medium or high implementation such as the Netherlands, England, Finland and Switzerland, the services were nationally initiated a few years ago, which indicates that large-scale implementation is time consuming. Moreover, the level of implementation of the service could be influenced by different factors: *e.g.* service reimbursement[29] or commissioning, the time span since service initiation, local or nation wide initiative, training and education. The majority of the MR services with medium or high implementation were remunerated by the government or health insurance. A study focusing on clinical MR in cardiovascular patients in the Netherlands concluded that lack of reimbursement and high time demands to perform the MR were the main reasons for service unsustainability.[31] Our data suggests reimbursement may be partly accountable for facilitated implementation. The Netherlands has a high level of implementation of MR services (~100% for type 1 and type 3 MR services), because Dutch pharmacies are obliged to provide type 1 MRs and the inspectorate also monitors the performance of type 3 MR. Previous Dutch studies have also shown that MR reduces drug-related problems and hence improve the quality of drug therapy[32, 33], factors that may also lead to higher service uptake. MRs have also proven to improve blood pressure

control, low-density lipoprotein, medication adherence, and contribute to reduced healthcare costs.[11] This evidence of impact on outcomes is likely to influence stakeholders' perspectives and willingness to cooperate and contribute to wider dissemination.[11] Behavior change in proactive service provision is likely to be feasible, but challenges at different levels (personal, team, institution, wider environment) need to be overcome.[34]

Remuneration for MR services is available in 10 out of the 19 countries, where respondents reported to provide MR by a third-party payer. Comparing remuneration with other pharmacist-led cognitive services, MR services were the most frequently remunerated.[6] Looking into details in the current study reveals that only 15.4% (2/13) of the provided type 1 MR services were remunerated, compared to 35.7% (5/14) in type 2a, and 75.0% (3/4) in type 3 MR services, whereas the type 2b MR in Finland is not remunerated by a third-party payer. This difference is plausible since human and financial resources needed to perform a type 3 MR review are far higher than those for type 1 MR. Community pharmacies offering MR services without remuneration might provide the service at their own cost or require the patient to bare the cost. This situation and the low rates of remuneration of structured pharmacy services are unsatisfactory and call for action.

Eligibility criteria exist in several countries, especially for types 2a, 2b and type 3 MR service (*e.g.* ≥ 5 medications, ≥ 65 years, living in a homecare or nursing home, high risk medication, recent hospital discharge etc.). These criteria are similar to those previously reported in the literature.[20, 35-38] However, a large number of countries have no specific criteria for patient selection and pharmacists themselves take the decision to select patients based on a perceived clinical need.

Data triangulation was used to collect representative information from different stakeholders. Even if this comprehensive approach was only partially successful, complete data in 12 countries revealed interesting heterogeneity among responses. These experiences should be respected when other pan-European surveys are planned.

Strengths and limitations

The present survey completed in October 2017 included participants with different backgrounds (community pharmacy, pharmacy practice research or in health policy) aiming to increase data credibility. Nonetheless, the strategy used to reach further participants through a key representative could potentially lead to selection bias. It should be noted, however, that our study reflects the situation in 2016-2017 and may have changed between then and the date of this publication. The process of data consolidation was very time consuming and leading to a delay in making final results available.

It is essential to consider that MR is a complex pharmaceutical intervention with different types of MR and variable issues to be addressed, strongly dependent on multiple factors such as legal frameworks and the context, where the service is provided within the countries.[39] Theses differences represent a challenge when trying to standardize concepts. Even though the multinational research team had a wide

network across Europe, not all European countries were reached, despite intense attempts. Consequently, there is still some uncertainty regarding the responses, especially from Georgia, Serbia and France. The type 1 MR service based on the medication history was difficult to distinguish from daily community pharmacy practice, particularly in two countries (England, Sweden), despite having stated that type 1 MR service is more than just the daily dispensing and counselling routine. Because fees for national services may be confidential data in some countries, it was avoided to report country specific fees for MR services.

Conclusion

Our overview of the provided community pharmacist-led MR services in Europe in 2016 and 2017 presents detailed information on specific service characteristics and enables an insight into a wide pattern of MR services available in Europe. There is large heterogeneity across Europe in all aspects, the characteristics of the services, the implementation and the remuneration. Moreover, complexity of the MR type seems to be associated with remuneration. Types 1 and 2a MR services were more frequently provided, suggesting they may be more feasible to implement in community pharmacy. Although no major development over the last few years could be observed, the large number of ongoing projects on MRs in community pharmacies suggests that new MR services could become implemented in Europe in the coming years. The comprehensive information provided in this paper could help researchers, representative associations and policy makers to reengineer current services or to establish new ones.

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Ethics approval

The Ethical approval for the PRACTISE study was obtained from “Comissão de Ética Egas Moniz” on 26th October 2016 (Proc. Number 515).

Figure legends

Figure 1 legend: Figure 1: Comparison of survey responses by working the three different working background and after data consolidation n=12 (Croatia, Estonia, Finland, Germany, Hungary, Iceland, Malta, Portugal, Slovakia, Slovenia, Switzerland, Turkey)

Table legends

Table 1 legend: Table 1. PCNE classification of MR with the according sources of information[17]

Table 2 legend: Table2. Overview of the available MR services and projects across Europe

Table 3 legend: Table 3. Type 1 and type 2a MR services and projects – characterization, remuneration and implementation

Table 4 legend: Table 4. Type 2b and type 3 MR services and projects – characterization, remuneration and implementation

Additional files

Additional file 1: Survey used to evaluate the different types of MR available in each country, extracted from Findmind Tool ®.

Additional file 2: Medication- and patient- related issues during MR

Additional file 3: Illustrative examples of different types of MR (Switzerland, England, Slovenia, the Netherlands)

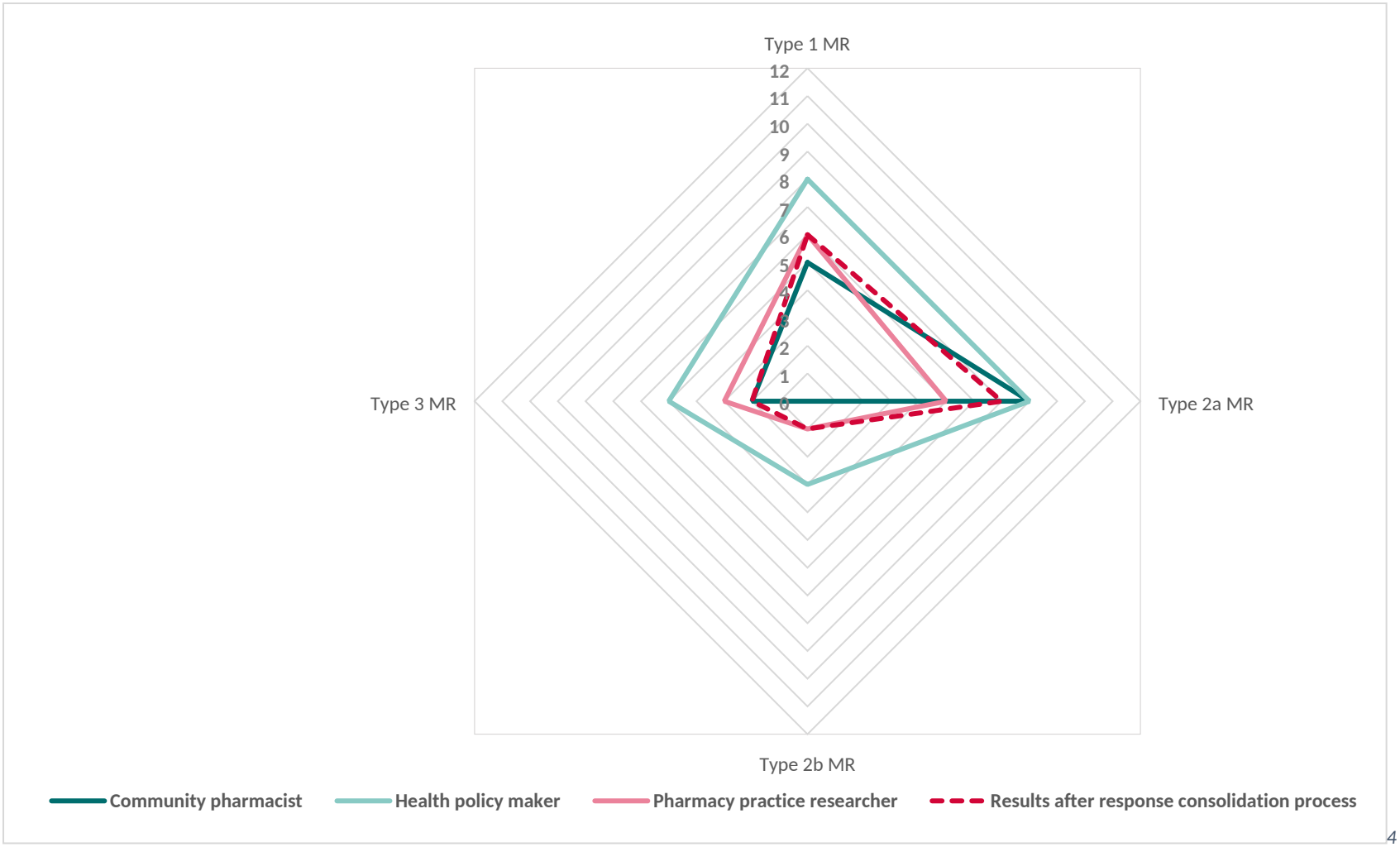

Figure 1: Comparison of survey responses by working the three different working background and after data consolidation n=12 (Croatia, Estonia, Finland, Germany, Hungary, Iceland, Malta, Portugal, Slovakia, Slovenia, Switzerland, Turkey)

Table 1: PCNE classification of MR with the according sources of information[17]

Characterization:		**Availability of information**		
Type	**Level**	**Medication history**	**Patient interview**	**Clinical data**
Type 1	Simple	✓		
Type 2a	Intermediate	✓	✓	
Type 2b	Intermediate	✓		✓
Type 3	Advanced	✓	✓	✓

Table 2: Overview of the available MR services and projects

Countries/ Regions	Type 1 MR (medication history)	Type 2a MR (medication history + patient interview)	Type 2b MR (medication history + clinical data)	Type 3 MR (medication history + patient interview +clinical data)
Austria [1]	✓°			✓
Belgium [1]		✓°		
Croatia [1]	✓°	✓		
Denmark [1]	✓°	✓°		
England [2]		✓	*	*
Finland [1]†	✓	✓	✓	✓
France [3]	✓	-	-	-
Germany [1]	✓°	✓°		✓°
Hungary [1]	✓°	✓°		
Northern Ireland [1]	✓	✓	✓	
Norway [1]	✓			
Portugal [1]		✓		
Slovakia [1]	✓°			
Slovenia [1]		✓	*	*
Spain [1]		✓		
Sweden [2]		✓		
Switzerland [1]	✓	✓		
The Netherlands [1]	✓			✓
Ukraine [1]	✓°	✓°		

No implemented MR service or project: Albania[1], Bulgaria[1], Estonia[2], Iceland[1], Ireland[1], Kosovo[2], Latvia[2], Luxembourg[1], Macedonia[1], Malta[1], Poland[1], Romania[1], Turkey[1], Georgia[3], and Serbia[3]

[1] Full validation of data (all participants or majority); [2] Partial validation of data (one participant/validator); [3] No validation of data
MR = medication review, GP = general practitioner
° ongoing project on MR (no implemented procedure); * MR performed outside of the community pharmacy (GP practices or healthcare centers); † BSc and MSc in pharmacy ; - no result

Table 3: Type 1 and type 2a MR services and projects – characterization, remuneration and implementation

	Country	Characterization					Remuneration	Implementation
		Local/national service or project	Starting year	Medication history with prescription AND non-prescription medicines	Medication history AND comprehensive refill data	Initiation of the MR	Remuneration by the government or health insurance	Level of implementation
Type 1 MR (medication history)	**Austria**	Project	2016	Yes	Yes	caregiver, patient, computer software	-	Project
	Croatia	Project	2008	No	No	pharmacist, caregiver, patient	No	Project
	Denmark	Project	End of 1990	No	Yes	pharmacist	No	Project
	Finland†	National	2001	Yes	Yes	pharmacist, caregiver, patient	No	High
	France	Local	-	-	No	pharmacist	-	High
	Germany	Project	2014	Yes	Yes	-	Yes	Project
	Hungary	Project	2014	Yes	No	pharmacist, caregiver	No	Project
	Northern Ireland	National	-	-	-	-	No	-
	Norway	Local (specific pharmacy chain)	-	-	-	-	No	Low
	Slovakia	Project	2003	No	No	GP, patient	No	Project
	Switzerland	National	2001	Yes	Yes	pharmacist	Yes	High
	The Netherlands	National	1987	Yes	Yes	computer software	No	High
	Ukraine	Project	2005	No	No	pharmacist, GP, patient	No	Project
Type 2a (medication history + patient interview)	**Belgium**	Project	2016	Yes	Yes	pharmacist	Yes	Project
	Croatia	Local	2008	Yes	Yes	pharmacist, patient	No	Low
	Denmark	Project	2010	Yes	Yes	pharmacist, patient	No	Project
	England	National	2005	Yes	-	pharmacist, GP, patient, caregiver, computer software	Yes	High
	Finland†	National	2014	Yes	Yes	caregiver, patient	No	Low
	Germany	Project	2014	Yes	Yes	pharmacist, caregiver, patient	Yes	Project
	Hungary	Project	2014	Yes	No	pharmacist	No	Project
	Northern Ireland	National	2016	-	-	-	Yes	High
	Portugal	Local	1999	Yes	Yes	pharmacist, caregiver, patient	No	Low
	Slovenia	National	2014	Yes	No	pharmacist, GP, nurse, caregiver, patient	No	Low
	Spain	National	2016	No	Yes	pharmacist, caregiver, patient	No	-
	Sweden	National	2000	-	Yes	pharmacist, patient	No	High*
	Switzerland	National	2010	Yes	Yes	pharmacist, patient	Yes	Medium
	Ukraine	Project	2001	Yes	No	pharmacist, patient	No	Project

† BSc and MSc pharmacists, * offered by the majority of the community pharmacies, but actually carried out for a small number of patients, - no result
MR = medication review, GP = general practitioner
Level of implementation: low = 1-33%, medium = 34-66%, high = 67-100%

Table 4: Type 2b and type 3 services and projects – characterization, remuneration and implementation

	Country	Characterization							Remuneration	Implementation
		Local/national service or project	Starting year	Medication history with prescription AND non-prescription medicines	Medication history AND comprehensive refill data	Clinical conditions	Laboratory test results	Initiation of the MR	Remuneration by the government or health insurance	Level of implementation
Type 2b# (medication history + clinical data)	**Finland†**	National	2012	Yes	Yes	Yes	Yes	pharmacist, GP, nurse	No	Low
Type 3 MR (medication history + patient interview + clinical data)	**Austria**	Local	2016	Yes	-	Yes**	Yes**	pharmacist, caregiver, patient, computer software	Yes	Low
	Finland†	National	2005	Yes	Yes	Yes	Yes	GP makes decision and pharmacist, patient caregiver, nurse can propose the MR	No	Low
	Germany	Project	2016	Yes	Yes	No***	No***	pharmacist, GP	Yes	Project
	The Netherlands	National	2010	No	Yes	Yes	Yes	pharmacist, GP, caregiver, patient, computer software	Yes	High

† BSc and MSc in pharmacy, # no detailed description available from Northern Ireland, ** clinical conditions and laboratory test results are provided by the patient, *** cooperation with GPs ,- no results
MR = medication review, GP = general practitioner
Level of implementation: low = 1-33%, medium = 34-66%, high = 67-100%

Welcome

Dear colleagues
This is an invitation to participate in a survey on remuneration of pharmacist-led cognitive and medication review services primary care across Europe which was elaborated by members of the Pharmaceutical Care Network Europe (PCNE). You have been selected as one of at least two representatives for your country of residence.

Background and rationale
The first topic of the survey is the remuneration of pharmacist-led cognitive services in primary care. The value of the pharmacy profession is an issue worldwide and many countries pharmacists have been trying to move to a “fee for service” system. In 2015, the International Pharmaceutical Federation (FIP) collected data on remuneration models for community and hospital pharmacy. The survey identified large variations between remuneration models and highlighted that remuneration models are still largely focused on products and not on cognitive services. [1]

The second topic of the survey is medication review services, currently an ongoing issue across Europe. We would like to see how such a review is embedded in the professional services of community pharmacies. In 2011, Anna Bulajeva et al. performed a survey on medication review practices across European countries. [2] The pattern of drug related issues addressed through different types of medication reviews in the different countries presented a very heterogeneous picture. Since then, a big effort was done by the PCNE working group "medication review".

Aims
A) Presenting the current status of remuneration models for pharmacist-led cognitive services in primary care across Europe including a detailed description of the remuneration for medication reviews
B) Mapping pharmacist-led medication review services offered in community pharmacies across Europe and gathering comprehensive information on the service description.

In the unlikely event of an unsuccessful second reminder another representative will be approached in order to get at least three responses for each country. Answers for each country from all responders will be cross-checked and any contradiction will be solved in direct contact between respondent and the research team.

1 Instructions for completing the survey

Please read this instruction carefully!

It is very important for us to get full response to map the current and correct status of remunerated pharmacist-led cognitive services and medication review services across Europe, therefore we are very grateful, if you complete the entire survey.
The time for completing the survey strongly depends on the amount of services provided in a country and is estimated to 30-120 minutes.

You can discontinue answering the survey, the answered question will be saved. Afterwards

you are able to continue from the point you
have stopped via the link sent to your e-mail.

Questions with a red asterisk (*) are mandatory questions, you will not be able to continue until you answer the question.

Please fill in the survey for your national situation and answer the questions representatively for your whole country.

2 Consent

Be assured that all answers you provide will be kept in the strictest confidentiality.
Your email address will be stored only to track survey completion. Data will only be reported in an aggregated manner,
and it will not be possible to link data to a specific respondent.
Clicking the “Next” button below indicates that you consent to participate in this survey.

3 Demographic data

Please fill in the following demographic data for further questions or check your demographic data and correct all discrepancies.

First name

Surname*

Country*

Mail*

Comments

4 Background*

We would like to have at least three participant with different backgrounds (one practising pharmacist/one policy maker/one researcher). Please select, what matches best to you.

- Practising pharmacist (in community pharmacy or primary care)
- Policy maker (or member in an influential organisation)
- Researcher

5 Start Part A - Remuneration of pharmacist-led cognitive services

The following questions concerning the topic "remuneration of pharmacist-led cognitive services".
You will be provided with a list of pharmacist-led cognitive services, identified during literature search.

A pharmacist-led cognitive service is defined as a service provided or supervised by the pharmacist, based on a standardized and structured procedure, for the purpose of promoting optimal health and drug therapy and that is not necessarily drug-product related. [3]

For each of them, we would like you to state if they are available in the community pharmacy in your country. If they are not available or if they are a fix part of the medicine dispensing service (consequently of this remunerated fee), the next service is presented to you. Detailed questions about the remuneration of the medicine dispensing service itself will follow at the end of part A.

Take into account that we are interested in implemented services or projects run as a campaign in 2016, but NOT in pilot studies/projects. Feel free to add additional information about the services in the comment boxes.

To make sure, that all participants have the same understanding of a services, a definition for each service will be presented in all questions. Please answer the questions, referring to these definitions.

The answering of this part is quicker, if you have a list of pharmacist-led cognitive services and the corresponding fees of your country available next to you.

We are aware that fees for national service are confidential data, they will only be collected to calculate statistical figures (range, mean or median), but they will not be reported as country specific information!

48 End Part A - Remuneration of pharmacist-led cognitive services

Part A about remuneration of pharmacist-led cognitive services is finished. Thank you very much for answering the first part of the survey, the second part B about medication review services will follow now.

49 Start Part B - Medication review services

For the mapping of current available medication review services across Europe and the comparison of these services, the definition of ”medication review” as core activity of a medication review service is pivotal:

"Medication review is a structured evaluation of a patient‘s medicines with the aim of optimising medicines use and improving health outcomes. This
entails detecting drug related problems and recommending interventions." [26]

Additionally, take into account that the medication review service is beyond the daily counselling (especially in Type 1 medication review) and has to be performed by the pharmacist or under the supervision of a pharmacist in community pharmacy.

All following questions are based on the official PCNE typology of medication review [26] (see table on the right side).
If none of the listed medication review procedures applies to your situation, please select the one closest to it.

Characterisation		***Information available:***		
Type	***Level***	Medication history	Patient interview	Clinical Data
Type 1	Simple	+		
Type 2a	Intermediate	+	+	
Type 2b	Intermediate	+		+
Type 3	Advanced	+	+	+

50 Type 1 - Simple medication review - Types and Problems

The following questions concerning the type 1 medication review (simple medication review) based on the medication history in primary care settings.

PCNE provided a list of specific problems detectable by type 1 medication reviews, based on patients' medication history. [26,27]

Characterisation		*Information available:*		
Type	*Level*	Medication history	Patient interview	Clinical Data
Type 1	Simple	+		
Type 2a	Intermediate	+	+	
Type 2b	Intermediate	+		+
Type 3	Advanced	+	+	+

Medication review type 1 (simple MR) and problems that can be detected	
Prescription	
- drug-drug interactions, duplication	- duration, dose, dosing time, dosing interval
- contraindication because of age/gender	- drug cost, derived indication
- inappropriate drug (e.g. Beers criteria)	- adherence (partly)

Zoom

51 Type 1 - Simple medication review*

Do you have a type 1 medication review in your country?

- Yes (implemented, ongoing project, project will start in the next 3 years)
- A project was stopped in the past 65
- No 65

Please provide the official name in your own language of this medication review for country-specific

52 Type 1 - Simple medication review

Please answer the following questions for the most widespread type 1 medication review in your country. If you have more than one type 1 medication review in your country, you will have the possibility to add these information further down.

53 Type 1 - simple medication review - Performance

Who performs this type 1 medication review?

- Pharmacist only
- Technician/pharmaconomist under the responsibility of a pharmacist
- Partly by the pharmacist and partly by the technician/pharmaconomist
- Other (please specify in the comment box below)

Comment

54 Type 1 - Simple medication review - Implementation

What is correct for type 1 medication review in your country: The type 1 medication review...

	Yes	No	I don't know
... is a local (one or some pharmacies) procedure	○	○	○
... is a national procedure	○	○	○
... is implemented (routine and sustained procedures)	○	○	○
... is an ongoing project/study on medication review	○	○	○
... is a project that will start in near future (next 3 years)	○	○	○

Comment

55 Type 1 - Simple medication review - Starting year

Since when do you have this local/national type 1 medication review in your country?

Comment

56 Type 1 - Simple medication review - Decision of provision/information

What is correct for type 1 medication review in your country: For the type 1 medication review...

	Yes	No	I don't know
...the GP decides, if the patient needs a medication review	○	○	○
...the pharmacist decides, if the patient needs a medication review	○	○	○
...the nurse decides, if the patient needs a medication review	○	○	○
...the patient decides, if the he or she needs a medication review	○	○	○
...the carer decides, if the patient needs a medication review	○	○	○

	Yes	No	I don't know
... the computer software triggers, if the patient needs a medication review	○	○	○
...the pharmacist has the medication history with prescription AND non-prescription medicines as information	○	○	○
...the pharmacist has the medication history with prescription medicine AND comprehensive refill data as information	○	○	○
… the pharmacist updates the community pharmacy medication record	○	○	○
... the pharmacist updates the shared medication record	○	○	○
…the pharmacist uses an official case report form for documentation	○	○	○

Comment

57 Type 1 - Simple medication review - Eligibility criteria

Do you have specific eligibility criteria for patients to perform this type 1 medication review?

- ○ Yes (Please specify or comment your answer)
- ○ No 58
- ○ I don't know 58

Please specify the eligibility criteria below.

58 Type 1 - Simple medication review - Issues

What issues are addressed during the type 1 medication review? (multiple answers possible) [29]

- Contraindications because of age / gender or derived indication
- Appropriateness of drug choice (e.g. Beers criteria)
- Appropriateness of drug dose
- Appropriateness of dosing time/interval
- Drug-drug interactions
- Duplication (of therapeutic group or active ingredient)

Drug/treatment costs

Poor adherence (partly)

Treatment duration

Comment

59 Type 1 - Simple medication review - Clinical decision

Who is responsible for the clinical decisions based on the type 1 medication review? (multiple answers possible)

General practitioner

Pharmacist

Nurse

Patient

Comment

60 Type 1 - Simple medication review - Remuneration

● MEDICATION REVIEW TYPE 1=Medication review is a structured evaluation of a patient‘s medicines with the aim of optimising medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions (based on the medication history). [26] ● REMUNERATION = Remuneration of services is considered when a payment is made by the government (National Health Service) or the insurer to the pharmacy (or pharmacist) for the provided service. Payment out-of-pocket by the patient is NOT considered.[4]

What is the approximate proportion of pharmacies providing this service? (in %)

Is the service currently remunerated (2016)? Yes/No

How much does the pharmacy receive for this service in Euro (€)? (Please specify the unit measure e.g. per patient, per medicine, per month…)

Is there an upper limit of this type 1 medication review services per patient per year that are remunerated? Yes(please specify)/ No

Comment

61 Type 1 - Simple medication review - General practitioner involvement

Involvement of the general practitioner (GP)

	Mandatory	Pharmacist decides upon need for information exchange	No	I don't know
A case report on findings is send to GP	○	○	○	○
An updated medication record is send to the GP	○	○	○	○
A medication action plan is send to the GP	○	○	○	○
There is a case conference with the GP	○	○	○	○

Comment

62 Type 1 - Simple medication review - Accreditation

Do pharmacists need an accreditation in your country to provide type 1 medication review?

- ○ Yes (please specify below)
- ○ No

Please specify below.

63 Type 1 - Simple medication review - Published studies

Are there published studies regarding the medication review type 1 in your country?

Yes (Please provide references or links about these studies, reports and other materials related to your medication review procedure)

No

Please provide as much information as possible or send document to:

tamara.isenegger@unibas.ch

64 Type 1 - Simple medication review - Instruction/Guidelines

If you have any written instruction/guideline, please provide a link to these instruction/guidelines.

Comment

65 Type 2a - Intermediate medication review

The following questions concerning the type 2a medication review (intermediate medication review) based on the medication history and patient interview in primary care settings.

PCNE provided a list of specific problems detectable by type 2a medication reviews, based on patients' medication history and patient interview.
[26,27]

Characterisation		*Information available:*		
Type	*Level*	Medication history	Patient interview	Clinical Data
Type 1	Simple	+		
Type 2a	Intermediate	+	+	
Type 2b	Intermediate	+		+
Type 3	Advanced	+	+	+

Medication review type 2a (intermediate MR) and problems that can be detected	
Prescription - drug-drug interactions, duplication - contraindication because of age/gender - inappropriate drug (e.g. Beers criteria)	- duration, dose, dosing time, dosing interval - drug cost, derived indication - adherence (partly)
Patient interview - adherence: difficulty to use dosage form, irrational use - incorrect instructions, need of drug information - adverse drug reactions - some aspects of effectiveness (e.g., pain)	

Zoom

66 Type 2a - Intermediate medication review*

Do you have a type 2a medication review in your country?

- Yes (implemented, ongoing project, project will start in the next 3 years)
- A project was stopped in the past 80
- No 80

Please provide the official name of this medication review in your own language for country-specific

67 Type 2a - Intermediate medication review

Please answer the following questions for the most widespread type 2a medication review in your country. If you have more than one type 2a medication review in your country, you will have the possibility to add these information further down.

68 Type 2a - Intermediate medication review - Performance

Who performs this type 2a medication review?

- Pharmacist only
- Technician/pharmaconomist under the responsibility of a pharmacist
- Partly by the pharmacist and partly by the technician/pharmaconomist

Other (please specify in the comment box below)

Comment

69 Type 2a - Intermediate medication review - Implementation

What is correct for type 2a medication review in your country: The type 2a medication review...

	Yes	No	I don't know
... is a local (one or some pharmacies) procedure			
... is a national procedure			
... is implemented (routine and sustained procedures)			
... is an ongoing project/study on medication review			
... is a project that will start in near future (next 3 years)			

Comment

70 Type 2a - Intermediate medication review - Starting year

Since when do you have this local/national type 2a medication review in your country?

Comment

71 Type 2a - Intermediate medication review - Decision of provision/information

What is correct for type 2a medication review in your country: For the type 2a medication review...

	Yes	No	I don't know
...the GP decides, if the patient needs a medication review			
...the pharmacist decides, if the patient needs a medication review			
...the nurse decides, if the patient needs a medication review			
...the patient decides, if the he or she needs a medication review			

	Yes	No	I don't know
...the carer decides, if the patient needs a medication review	○	○	○
...the computer software triggers, if the patient needs a medication review	○	○	○
...the pharmacist has the medication history with prescription AND non-prescription medicines as information	○	○	○
...the pharmacist has the medication history with prescription medicine AND comprehensive refill data as information	○	○	○
… the pharmacist updates the community pharmacy medication record	○	○	○
... the pharmacist updates the shared medication record	○	○	○
…the pharmacist uses an official case report form for documentation	○	○	○
…the pharmacist has a patient consent form for documentation	○	○	○
…the pharmacist has an interview form for documentation	○	○	○

Comment

72 Type 2a - Intermediate medication review - Eligibility criteria

Do you have specific eligibility criteria for patients to perform this type 2a medication review?

- ○ Yes (Please specify or comment your answer)
- ○ No 73
- ○ I don't know 73

Please specify the eligibility criteria below.

73 Type 2a - Intermediate medication review - Issues

What issues are addressed during this type 2a medication review? (multiple answers possible) [29]

- Adverse drug reactions
- Some aspects of effectiveness (e.g. pain)
- Contraindications age/gender

Appropriateness of drug choice (e.g. Beers criteria)

Appropriateness of drug dose

Appropriateness of drug form

Irrational drug use

Incorrect instructions

Need of drug information

Appropriateness of treatment duration

Appropriateness of dosing time/interval

Drug-drug interactions

Duplication (of therapeutic group or active ingredient)

Drug/treatment costs

Adherence

Patient dissatisfaction with the therapy

Swallowing difficulties

Handling of medication (inhaler devices, blister packs)

Adherence aid (e.g. pill organiser, multidrug punch card, dose dispensing service)

Allergies

Lifestyle (smoking, alcohol, caffeine, recreational drugs, physical activity)

Comment

74 Type 2a - Intermediate medication review - Clinical decision

Who is responsible for the clinical decisions based on the medication review? (multiple answers possible)

General practitioner

Pharmacist

Nurse

Patient

Comment

75 Type 2a - Intermediate medication review - Remuneration

● MEDICATION REVIEW TYPE 2a=Medication review is a structured evaluation of a patient‘s medicines with the aim of optimising medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions.(medication history + patient interview) (PCNE, Position Paper on the PCNE definition of Medication Review 2016)
● REMUNERATION = Remuneration of services is considered when a payment is made by the government (National Health Service) or the insurer to the pharmacy (or pharmacist) for the provided service. Payment out-of-pocket by the patient is NOT considered.

What is the approximate proportion of pharmacies providing this service? (in %)

Is the service currently remunerated (2016)? Yes/No

How much does the pharmacy receive for this service in Euro (€)? (Please specify the unit measure e.g. per patient, per medicine, per month...)

Is there an upper limit of this type 2a medication review services per patient per year that are remunerated? Yes(please specify)/ No

Comment

76 Type 2a - Intermediate medication review - General practitioner involvement

Involvement of the general practitioner (GP)

	Mandatory	Pharmacist decides upon need for information exchange	No	I don't know
A case report on findings is send to GP				
An updated medication record is send to the GP				
A medication action plan is send to the GP				
There is a case conference with the GP				

Comment

77 Type 2a - Intermediate medication review - Accreditation

Do pharmacists need an accreditation in your country to provide type 2a medication review?

- Yes (please specify below)
- No

Please specify below.

78 Type 2a - Intermediate medication review - Published studies

Are there published studies regarding the medication review type 2a in your country?

- Yes (Please provide references or links about these studies, reports and other materials related to your medication review procedure)
- No

Please provide as much information as possible or send document to:

tamara.isenegger@unibas.ch

79 Type 2a - Intermediate medication review - Instructions/Guidelines

If you have any written instruction/guidelines, please provide a link to these instruction/guidelines.

80 Type 2b - Intermediate medication review

The following questions concerning the type 2b medication review (intermediate medication review) based on the medication history and clinical data in primary care settings.

PCNE provided a list of specific problems that can be detectable with type 2b medication reviews, based on patients' medication history and clinical data. [26,27]

Characterisation		***Information available:***		
Type	***Level***	Medication history	Patient interview	Clinical Data
Type 1	Simple	+		
Type 2a	Intermediate	+	+	
Type 2b	Intermediate	+		+
Type 3	Advanced	+	+	+

Medication review type 2b (intermediate MR) and problems that can be detected	
Prescription - drug-drug interactions, duplication - contraindication because of age/gender - inappropriate drug (e.g. Beers criteria)	- duration, dose, dosing time, dosing interval - drug cost, derived indication - adherence (partly)
Clinical patient data - untreated indication - validity of indication - contraindication (e.g. kidney function, allergy) - response to therapy = effectiveness	

Zoom

81 Type 2b - Intermediate medication review*

Do you have a type 2b medication review in your country?

- Yes (implemented, ongoing project, project will start in the next 3 years)
- A project was stopped in the past 95
- No 95

Please provide the official name of this medication review in your own language for country-specific

82 Type 2b - Intermediate medication review

Please answer the following questions for the most widespread type 2b medication review in your country. If you have more than one type 2b medication review in your country, you will have the possibility to add these information further down.

83 Type 2b - Intermediate medication review - Performance

Who performs this type 2b medication review?

- Pharmacist only
- Technician/pharmaconomist under the responsibility of a pharmacist
- Partly by the pharmacist and partly by technician/pharmaconomist
- Other (please specify below)

Comment

84 Type 2b - Intermediate medication review - Implementation

What is correct for type 2b medication review in your country: The type 2b medication review...

	Yes	No	I don't know
... is a local (one or some pharmacies) procedure			
... is a national procedure			
... is implemented (routine and sustained procedures)			
... is an ongoing project/study on medication review			
... is a project that will start in near future (next 3 years)			

Comment

85 Type 2b - Intermediate medication review - Starting year

Since when do you have this local/national type 2b medication review in your country?

Comment

86 Type 2b - Intermediate medication review - Decision of provision/information

What is correct for type 2b medication review in your country: For the type 2b medication review...

	Yes	No	I don't know
...the GP decides, if the patient needs a medication review	○	○	○
...the pharmacist decides, if the patient needs a medication review	○	○	○
...the nurse decides, if the patient needs a medication review	○	○	○
...the patient decides, if the he or she needs a medication review	○	○	○
...the carer decides, if the patient needs a medication review	○	○	○
... the computer software triggers, if the patient needs a medication review	○	○	○
...the pharmacist has the medication history with prescription AND non-prescription medicines as information	○	○	○
...the pharmacist has the medication history with prescription medicine AND comprehensive refill data as information	○	○	○
...the pharmacist has the clinical conditions as information	○	○	○
...the pharmacist has the laboratory test results as information	○	○	○
… the pharmacist updates the community pharmacy medication record	○	○	○
... the pharmacist updates the shared medication record	○	○	○
…the pharmacist uses an official case report form for documentation	○	○	○

Comment

87 Type 2b - Intermediate medication review - Eligibility criteria

Do you have specific eligibility criteria for patients to perform this type 2b medication review?

- ○ Yes (Please specify or comment your answer)
- ○ No 88
- ○ I don't know 88

Please specify the eligibility criteria below.

88 Type 2b - Intermediate medication review - Issues

What issues are addressed during this type 2b medication review? (multiple answers possible) [29]

- Effectiveness of treatment
- Untreated conditions (indications without treatment)
- Unnecessary drug treatment (treatments without indication)
- Adverse drug reactions
- Contraindications (against e.g. kidney function, allergy)
- Appropriateness of drug choice (e.g. Beers criteria)
- Appropriateness of drug dose against indication
- Appropriateness of treatment duration
- Appropriateness of dosing time/interval
- Drug-drug interactions
- Duplication (of therapeutic group or active ingredient)
- Drug/treatment costs
- Adherence (partly)
- Adherence aid (e.g. pill organiser, multidrug punch card, dose dispensing service)
- Allergies

Comment

89 Type 2b - Intermediate medication review - Clinical decision

Who is responsible for the clinical decisions based on the medication review? (multiple answers possible)

- General practitioner
- Pharmacist
- Nurse
- Patient

Comment

90 Type 2b - Intermediate medication review - Remuneration

● MEDICATION REVIEW TYPE 2b=Medication review is a structured evaluation of a patient‘s medicines with the aim of optimising medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions. (medication history + clinical data) (PCNE, Position Paper on the PCNE definition of Medication Review 2016) ● REMUNERATION = Remuneration of services is considered when a payment is made by the government (National Health Service) or the insurer to the pharmacy (or pharmacist) for the provided service. Payment out-of-pocket by the patient is NOT considered.

What is the approximate proportion of pharmacies providing this service? (in %)

Is the service currently remunerated (2016)? Yes/No

How much does the pharmacy receive for this service in Euro (€)? (Please specify the unit measure e.g. per patient, per medicine, per month...)

Is there an upper limit of this type 2b medication review services per patient per year that are remunerated? Yes(please specify)/ No

Comment

91 Type 2b - Intermediate medication review - General practitioner involvement

Involvement of the general practitioner (GP)

	Mandatory	Pharmacist decides upon need for information exchange	No	I don't know
A case report on findings is send to GP				
An updated medication record is send to the GP				
A medication action plan is send to the GP				
There is a case conference with the GP				

Comment

92 Type 2b - Intermediate medication review - Accreditation

Do pharmacists need an accreditation in your country to provide type 2b medication review?

- Yes (please specify below)
- No

Please specify below.

93 Type 2b - Intermediate medication review - Published studies

Are there published studies regarding the type 2b medication review in your country?

- Yes (Please provide references or links about these studies, reports and other materials related to your medication review procedure)
- No

Please provide as much information as possible or send document to:

tamara.isenegger@unibas.ch

94 Type 2b - Intermediate medication review - Instructions/Guidelines

If you have any written instruction/guideline, please provide a link to these instruction/guidelines.

95 Type 3 - Advanced medication review

The following questions concerning the type 3 medication review (intermediate medication review) based on the medication history and clinical data in primary care settings.

PCNE provided a list of specific problems detectable by type 3 medication reviews, based on patients' medication history, patient interview, and clinical data. [26,27]

Characterisation		***Information available:***		
Type	***Level***	Medication history	Patient interview	Clinical Data
Type 1	Simple	+		
Type 2a	Intermediate	+	+	
Type 2b	Intermediate	+		+
Type 3	Advanced	+	+	+

Medication review type 3 (advanced MR) and problems that can be detected	
Prescription	
- drug-drug interactions, duplication	- duration, dose, dosing time, dosing in
- contraindication because of age/gender	- drug cost, derived indication
- inappropriate drug (e.g. Beers criteria)	- adherence (partly)
Patient interview	
- adherence: difficulty to use dosage form, irrational use	
- incorrect instructions, need of drug information	
- adverse drug reactions	
- some aspects of effectiveness (e.g., pain)	
Clinical patient data	
- untreated indication	
- validity of indication	
- contraindication (e.g. kidney function, allergy)	
- response to therapy = effectiveness	

96 Type 3 - Advanced medication review*

Do you have a type 3 medication review in your country?

- Yes (implemented, ongoing project, project will start in the next 3 years)

- A project was stopped in the past 115
- No 115

Please provide the official name of this medication review in your own language for country-

specific

97 Type 3 - Advanced medication review

Please answer the following questions for the most widespread type 3 medication review in your country. If you have more than one type 3 medication review in your country, you will have the possibility to add these information further down.

98 Type 3 - Advanced medication review - Performance

Who performs this type 3 medication review?

- Pharmacist only
- Technician/pharmaconomist under the responsibility of a pharmacist
- Partly by the pharmacist and partly by the technician/pharmaconomist
- Other (please specify in the comment box below)

Comment

99 Type 3 - Advanced medication review - Implementation

What is correct for type 3 medication review in your country: The type 3 medication review...

	Yes	No	I don't know
... is a local (one or some pharmacies) procedure			
... is a national procedure			
... is implemented (routine and sustained procedures)			
... is an ongoing project/study on medication review			
... is a project that will start in near future (next 3 years)			

Comment

100 Type 3 - Advanced medication review - Starting year

Since when do you have this local/national type 3 medication review in your country?

Comment

101 Type 3 - Advanced medication review - Decision of provision/information

What is correct for type 3 medication review in your country: For the type 3 medication review...

	Yes	No	I don't know
...the GP decides, if the patient needs a medication review			
...the pharmacist decides, if the patient needs a medication review			
...the nurse decides, if the patient needs a medication review			
...the patient decides, if the he or she needs a medication review			
...the carer decides, if the patient needs a medication review			
... the computer software triggers, if the patient needs a medication review			
...the pharmacist has the medication history with prescription AND non-prescription medicines as information			
...the pharmacist has the medication history with prescription medicine AND comprehensive refill data as information			
...the pharmacist has the clinical conditions as information			
...the pharmacist has the laboratory test results as information			
… the pharmacist updates the community pharmacy medication record			
... the pharmacist updates the shared medication record			
…the pharmacist uses an official case report form for documentation			
…the pharmacist has a patient consent form for documentation			
…the pharmacist has an interview form for documentation			

Comment

102 Type 3 - Advanced medication review -Eligibility criteria

Do you have specific eligibility criteria for patients to perform this type 3 medication review?

- Yes (Please, specify or comment your answer)
- No 103
- I don't know 103

Please specify below.

103 Type 3 - Advanced medication review - Issues

What issues are addressed during this type 3 medication review? (multiple answers possible) [29]

Effectiveness of treatment

Untreated conditions (indications without treatment)

Unnecessary drug treatment (treatments without indication)

Adverse drug reactions

Contraindications

Appropriateness of drug choice (e.g. in regard to the Beers criteria, the indication, blood values)

Appropriateness of drug dose

Appropriateness of drug form

Irrational drug use

Incorrect instructions

Need of drug information

Appropriateness of treatment duration

Appropriateness of dosing time/interval

Drug-drug interactions

Duplication (of therapeutic group or active ingredient)

Drug/treatment costs

Adherence

Patient dissatisfaction with the therapy

Swallowing difficulties

Handling of medication (inhaler devices, blister packs)

Adherence aid (e.g. pill organiser, multidrug punch card, dose dispensing service)

Allergies

Lifestyle (smoking, alcohol, caffeine, recreational drugs, physical activity)

Comment

104 Type 3 - Advanced medication review - Clinical decision

Who is responsible for the clinical decisions based on the medication review? (multiple answers possible)

General practitioner

Pharmacist

Nurse

Patient

Comment

105 Type 3 - Advanced medication review - Remuneration

● MEDICATION REVIEW TYPE 3 =Medication review is a structured evaluation of a patient's medicines with the aim of optimising medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions. (medication history+patient interview +clinical data) (PCNE, Position Paper on the PCNE definition of Medication Review 2016) ● REMUNERATION = Remuneration of services is considered when a payment is made by the government (National Health Service) or the insurer to the pharmacy (or pharmacist) for the provided service. Payment out-of-pocket by the patient is NOT considered.

What is the approximate proportion of pharmacies providing this service? (in %)

Is the service currently remunerated (2016)? Yes/No

How much does the pharmacy receive for this service in Euro (€)? (Please specify the unit measure e.g. per patient, per medicine, per month…)

Is there an upper limit of this type 3 medication review services per patient per year that are remunerated? Yes(please specify)/ No

Comment

106 Type 3 - Advanced medication review - General practitioner involvement

Involvement of the general practitioner (GP)

	Mandatory	Pharmacist decides upon need for information exchange	No	I don't know
A case report on findings is send to GP	○	○	○	○
An updated medication record is send to the GP	○	○	○	○
A medication action plan is send to the GP	○	○	○	○
There is a case conference with the GP	○	○	○	○

Comment

107 Type 3 - Advanced medication review - Accreditation

Do pharmacists need an accreditation in your country to provide type 3 medication review?

- ○ Yes (please specify below)
- ○ No

Please, specify below.

108 Type 3 - Advanced medication review - Published studies

Are there published studies regarding the type 3 medication review in your country?

Yes (Please provide references or links about these studies, reports and other materials related to your medication review procedure)

No

Please provide as much information as possible or send document to:

tamara.isenegger@unibas.ch

109 Type 3 - Advanced medication review - Instructions/Guidelines

If you have any written instruction/guideline, please provide a link to these instruction/guidelines.

110 Medication review - Follow-up

Please select all types of medication reviews, where the statement is correct? ● Follow-up = to maintain contact with a person so as to monitor the effects of earlier activitiy [30]

	Type 1	Type 2a	Type 2b	Type 3
The follow-up is a mandatory part of the medication review (please explain the procedure in the comment box)				
The follow-up is an optional part of the medication review (please explain the procedure in the comment box)				
There is no follow-up after the medication review				
The follow-up is remunerated separately from the medication review (please specify in the comment box)				
The follow-up is NOT remunerated				
A written follow-up plan is sent to the GP				

Explain follow-up procedure and method of delivery in detail (appointment, phone call,

remuneration)

111 Health care professional in primary care

Are these types of medication reviews available to patients elsewhere within primary care, eventually provided by another health care professional? Please mark with a tick where appropriate. (multiple answers possible)

- GP
- Nurse within a community pharmacy
- Nurse outside a community pharmacy
- Pharmacist in another setting (e.g. GP practice)
- Other (please specify in the comment box)
- No

Please specify (e.g. 5. (immunisation) physician assistant)

112 Health care professional in primary care

Are these types of medication reviews available to patients elsewhere within primary care, eventually provided by another health care professional? Please mark with a tick where appropriate. (multiple answers possible)

	GP	Nurse within a community pharmacy	Nurse outside a community pharmacy	Pharmacist in another setting (e.g. GP practice)	Other (please specify in the comment box)	No
Type 1						
Type 2a						
Type 2b						
Type 3						

Additional file 2: Medication- and patient-related issues during MR

Type 1 MR	Austria°	Croatia°	Denmark °	Finland†	France	Germany °	Hungary°	Northern Ireland	Norway	Slovakia°	Switzerland	The Netherlands	Ukraine °
Contraindications because of age / gender or derived indication	Yes	Yes	Yes	No	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appropriateness of drug choice	-	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	No	Yes	Yes
Appropriateness of drug dose	-	Yes	Yes	Yes	-	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appropriateness of dosing time/interval	-	Yes	Yes	Yes	-	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Drug-drug interactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duplication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Drug/treatment costs	No	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Poor adherence (partly)	-	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Treatment duration	-	Yes	Yes	No	-	No	No	Yes	-	Yes	Yes	Yes	Yes

[0] ongoing project on MR (no standard procedure)
† Individuals with a BSc or MSc in pharmacy
- no results

(Continued)

Type 2a MR	Belgium °	Croatia	Denmark °	England	Finland†	Germany °	Hungary	Northern Ireland	Portugal	Slovenia	Spain	Sweden	Switzerland	Ukraine
Adverse drug reactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Some aspects of effectiveness	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Contraindications age/gender	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Appropriateness of drug choice	Yes	-	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Appropriateness of drug dose	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Appropriateness of drug form	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Irrational drug use	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incorrect instructions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Need of drug information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appropriateness of dosing time/interval	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Drug-drug interactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Appropriateness of treatment duration	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Duplication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Drug/treatment costs	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	No	Yes	No	Yes
Adherence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Patient dissatisfaction with the therapy	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Swallowing difficulties	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Handling of medication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adherence aid	Yes	Yes	Yes	Yes	No	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Allergies	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	-	-		Yes
Lifestyle	Yes	Yes	-	Yes	No	No	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes

° ongoing project on MR (no standard procedure)
† Individuals with a BSc or MSc in pharmacy
- no result

(Continued)

#Type 2b MR	Finland †
Effectiveness of treatment	Yes
Untreated conditions	Yes
Unnecessary drug treatment	Yes
Adverse drug reactions	Yes
Contraindication	Yes
Appropriateness of drug choice	Yes
Appropriateness of drug dose against indication	Yes
Appropriateness of treatment duration	Yes
Appropriateness of dosing time/interval	Yes
Drug-drug interactions	Yes
Duplication	Yes
Drug, treatment costs	No
Adherence (partly)	Yes
Adherence aid	No
Allergies	Yes

no detailed description available from Northern Ireland, † Individuals with a BSc or MSc in pharmacy

(Continued)

Type 3 MR	Austria	Finland†	Germany °	The Netherlands
Effectiveness of treatment	Yes	Yes	Yes	Yes
Untreated conditions	Yes	Yes	Yes	Yes
Unnecessary drug treatment	Yes	Yes	Yes	Yes
Adverse drug reactions	Yes	Yes	Yes	Yes
Contraindications	Yes	Yes	Yes	Yes
Appropriateness of drug choice	Yes	Yes	Yes	Yes
Appropriateness of drug dose	Yes	Yes	Yes	Yes
Appropriateness of drug form	Yes	Yes	Yes	Yes
Irrational drug use	Yes	Yes	Yes	Yes
Incorrect instructions	Yes	Yes	Yes	Yes
Need of drug information	Yes	Yes	Yes	Yes
Appropriateness of treatment duration	Yes	Yes	Yes	No
Appropriateness of dosing time/interval	Yes	Yes	Yes	No
Drug-drug interactions	Yes	Yes	Yes	Yes
Duplication	Yes	Yes	Yes	Yes
Drug/treatment costs	-	Yes	No	Yes
Adherence	Yes	Yes	Yes	Yes
Patient dissatisfaction with the therapy	Yes	Yes	No	Yes
Swallowing difficulties	Yes	Yes	No	Yes
Handling of medication	Yes	Yes	Yes	Yes
Adherence aid	Yes	Yes	No	Yes
Allergies	Yes	Yes	No	Yes
Lifestyle	No	Yes	No	Yes

° ongoing project on MR (no standard procedure)
† Individuals with a BSc or MSc in pharmacy
- no result

Additional file 3: Illustrative examples of different types of MR (Switzerland, England, Slovenia, the Netherlands)

Box 1: type 1 MR service – an example from Switzerland

In 2001, a new remuneration model for community pharmacies was introduced in Switzerland, away from margins depending on the price of the medication to a performance-based remuneration. This was the initiation of the type 1 MR service in Switzerland. This type 1 MR is performed in all patients filling a prescription or getting a prescription medication dispensed in one of the community pharmacies registered with the Swiss Pharmacy Association (83.3% of all Swiss Pharmacies).

Aim: To compare all prescriptions or prescription medication with patient's medication history (prescription +/- non-prescription medication) for abuse and hording, contraindications, drug interactions and dosage, risk factors, selection of optimized package size, possibility of repeat dispensing.

Who: All community pharmacists counsel patients about their prescription medication.

Where: In the community pharmacy.

When: Whenever the community pharmacy dispenses a prescription medication to a patient, without any eligibility criteria.

How: The type 1 MR in Switzerland consist of two parts:

- Drug-delivery check: Inconsistencies and contraindication are focused by pharmacists within a prescription. If illegibility or questions about the dosage occur, the pharmacist contacts the treating physician. In addition, the pharmacist suggests alternative options to the treating physicians in case of interactions in the prescription and informs the patient about possible risks and adverse reactions of the prescribed medication.

- Treatment check: Pharmacist compares the medication on the prescription with patients' medication history (list of prescription +/- non-prescription medication).

Remuneration: Community pharmacies are remunerated by the health insurance companies for the type 1 MR. The remuneration consists of a fix fee per prescription (approx. 3 €), plus a fee for each drug item on the prescription (approx. 4 €).

Box 2: type 2a MR service– an example from England

Aim: The service aims to primarily support patients in their medication adherence. It does this by identifying drug-related problems, educating patients about their medication and resolving any potential barriers to medication taking. A secondary objective is to reduce medication waste by promoting optimized repeat prescription management by patients.

Who: The community pharmacist can offer a MUR for all regular patients (receiving at least 3 months of prescriptions dispensed at the same pharmacy) or can provide one if a pharmaceutical need is identified (the service is then described as the Prescription Intervention Service). The pharmacist must undergo accreditation in order to be able to undertake MURs, and the pharmacy premises also needs to be declared as suitable for providing the service.

Where: Community pharmacies; however, special permission can be requested *(NHS England's approval)* to provide a MUR to a specific patient off-site (such as the patients' home) or via telephone.

When: In order to be eligible for a MUR, patients must take a minimum of two regular medications for a long term condition (or one medication if it is considered high risk). In addition, 70% of the MURs that a community pharmacy provides must be targeted at specific patient groups; patients taking high risk medication, patients recently discharged from hospital, respiratory or cardiovascular disease or those at risk of developing cardiovascular disease.

How: Community pharmacist uses the patient's medication record and a verbal patient medication history to identify pharmaceutical care needs. Where these can be addressed within the consultation this is done so, where an action needs to be taken by the prescriber, the community pharmacist highlights this on the patient's behalf. The prescriber is then responsible for making any decisions about any changes to therapy. A record of the consultation is kept within the pharmacy.

Remuneration: The pharmacy is remunerated 30 € for each completed MUR. Each pharmacy can provide a maximum of 400 MURs each year. This service is funded by the National Health Service.

Box 3: The type 3 MR service – an example from Slovenia

In 2016, a type 3 MR service named pharmacotherapy review was implemented and granted remuneration at the primary care level. This MR service was developed as type 3 MR, but in certain cases, when the patient is not able to attend the patient interview, a type 2b MR would be performed.

Aim: The service is primarily intended for the GPs' to help and consult them with optimizing patient's therapy.

Who: The GP refers the patients' medical documentation to a clinical pharmacist for MR. Clinical pharmacist is a Master of Pharmacy with a license, who finished 3-year post-graduate specialization course in clinical pharmacy and is certified to provide the service in practice by Slovene Chamber of Pharmacies.

Where: Primary care (ambulatory setting, nursing homes)

When: Whenever a GP recognizes the need for consultation with the clinical pharmacist. No specific eligibility criteria apply. Typically, the reasons for referral are the optimization of therapy due to polypharmacy, vital parameters or adverse drug events.

How: The clinical pharmacist reviews patient's medical documentation and writes the pharmacotherapy review report with recommendations. The report is sent back to a GP, who considers the recommendations and makes clinical decisions about patient's therapy. The clinical pharmacist is available for further explanations or follow up if needed and upon GP's request.

Remuneration: The service is financed by the National Health Insurance Institute, who assures an annual flat rate of 41.000€ per team, which involves one clinical pharmacist. This corresponds to a 32€ per MR gross (based on one full time equivalent), of which 85% goes to a clinical pharmacist (27€ gross). The actual payment is per performance. Clinical pharmacist is paid per hour and should perform 6 reviews in 8h.

Box 4: type 3 MR service – an example from the Netherlands

MR by pharmacists has already been introduced in the Netherlands around 1990.

In 2013, the Dutch Pharmacy Association (KNMP) issued a guideline about the process around MR, based on a national consensus report. This guideline is currently used by the pharmacists, payers, and inspectorate.

Aim: To optimize the existing pharmacotherapy of a patient, in order to prevent worsening of disease or adverse events of treatment. MR should also help to adjust treatment to the patient's wishes and improve self-management.

Who: Pharmacist, patient and GP together. Pharmacist has the lead. Patient or his representative must be involved. The payers require that all pharmacists who conduct reviews must have followed an accredited MR training (but there is no official special accreditation for the pharmacist). There are bi-annual updates for these trainings.

Where: In the pharmacy plus patient interview possibly at the patients' home. Results of the review are discussed with the treating GP, usually in the GP office.

When: According to the official pharmacist' guideline, a review is conducted once a year if a patient is 65 or older, and using ≥ 5 medications. Additionally, one or more of the following criteria should be met: living in nursing home or home for the elderly, a decreased kidney function (eGFR <50 ml/min), decreased cognition, increased risk of falls, signals of decreased adherence to treatment. In the national multidisciplinary guideline, there is an additional criterion that the patient has had an unexpected hospital admission. The advised frequency (once a year) depends also on the stability of the patient. Additional diseases or hospital discharge of a patient may be a reason for a renewed MR. Based on the above criteria, an average Dutch pharmacy (serving a population of 10.000 with mainly prescription medication) has around 550 patients that should have a MR. Additional local criteria may be used to select patients that are most in need.

How: A stepwise approach is advised, called the STRIP method (Systematic Tool to Reduce Inappropriate Prescribing). Because most patients go to the same pharmacy in the Netherlands, the pharmacists will have the prescription medication data from his patients at his fingertips. The STRIP method consists of the following steps: Pharmacotherapeutic anamnesis, pharmacotherapeutic analysis, preparing a pharmaceutical care plan & discussing the plan with the physician, discussing the pharmaceutical care plan and proposed treatment changes with the patient, follow-up with the patient and medical staff/physicians involved. There is a requirement to document the steps and the review result in the pharmacy.

Remuneration: Between 20 and 70 €, depending on the contract established with an insurance company. Pharmacists will only be contracted if they can prove that they followed a MR training.

Official Indicator: The number of MR according to the guideline is an important indicator in the Dutch Pharmacy Quality System. Additionally, the Inspectorate of the Ministry of Health checks that the annual number of reviews performed is above a certain limit (now in 2018, approx. 100 reviews annually).