Identifying Gaps in Community Pharmacists' Competence in Medication Risk Management in Routine Dispensing

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ABSTRACT

***Background**: Community pharmacists increasingly contribute to medication risk management while dispensing medicines to outpatients. Their risk management actions are shifting from medication counselling towards reviewing medications and following-up their therapeutic effects and outcomes. Acquiring these more clinical tasks require more patient care-oriented competences.*

***Objective:** To identify gaps in community pharmacists' competence in medication risk management in routine dispensing.*

***Setting:** All community pharmacies in Finland.*

***Method:** A national cross-sectional online survey was conducted through the Association of Finnish Pharmacies (n=574 community pharmacies) and the university pharmacies (n=2) in 2015. One pharmacist from each pharmacy was recommended to report on behalf of their outlet.*

***Main outcome measure:** Community pharmacists' self-assessed competence to: 1) identify medication-related risks, 2) utilise electronic tools in medication risk management, and 3) identify their perceived needs for developing competence in medication risk management.*

***Results:** Responses were received from 169 community pharmacies (response rate 29%). The highest proportion of good competency estimates were self-assessed in confirming doses (98% of the respondents evaluated their competence to be good) and identifying drug-drug interactions (83%). Competence to identify adverse effects, such as serotonergic load (10%) and anticholinergic load (12%), was most seldomly perceived as good. Of the wide range of electronic databases available, respondents most commonly reported using daily summaries of product characteristics (97% of the respondents), the checklist-type generic medicines information database that supports in medication counselling (85%), and the programme assisting in identifying drug-drug interactions (83%). The most commonly reported training needs were related to the identification of serotonergic load (63%), anticholinergic load (62%), and evaluating the clinical significance of drug-drug interactions (54%).*

***Conclusion:** The results indicate remarkable gaps in community pharmacists' current competence in medication risk management, particularly in their competence in applied and geriatric pharmacotherapy.*

Keywords: Medication safety, Medication risk management, Community pharmacy, Dispensing, Competence

INTRODUCTION

The need for medication risk management competences, defined as the integrated knowledge, skills and attitudes, has increased dramatically in community pharmacies [1]. This is primarily due to changes in demographics and population health as aging and subsequent morbidity are increasing, leading to complex medications and increased polypharmacy [2]. Growing scientific knowledge concerning pharmacotherapies and their rational clinical use facilitate optimisation of individual patients' medications, resulting in improved treatment outcomes and minimised risks and harms [3-6]. Therefore, expectations of incorporating prospective medication risk management activities as part of routine dispensing in community pharmacies have increased. This extends competence requirements of practising pharmacists towards clinical pharmacotherapy and patient care.

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Pharmacy education in many countries has shifted towards meeting these patient-care oriented competence needs [7-9]. The new generations of pharmacists should be well prepared to manage medications from a more clinical patient care approach, while the earlier generations may experience competence gaps in this respect [1-2,10]. The core competences consist of clinical pharmacotherapy expertise and its patient-specific application in routine practice, including the ability to communicate therapeutic issues with medicine users and other care team members [11-13]. In addition to these competences, pharmacists should know the principles of prospective risk management of pharmacotherapies based on systems thinking and their application in the community pharmacy context to avoid preventable harm caused by inappropriate medicine use [14].

Along with digitalisation, novel electronic databases have become routinely available in healthcare and community pharmacies to assist in medication risk management [15]. These databases have evolved from product-specific medicines information sources towards systems that prospectively analyse the appropriateness of an individual patient's entire

DOI: https://doi.org/10.24926/iip.v12i1.3510

drug regimen, making alerts on clinically significant risks. The "clinical eye" of professionals is needed to interpret information from the databases to make therapeutic decisions and to communicate them to patients and those involved in treatment.

Despite a growing need, little research has focused on investigating community pharmacists' clinical competence in medication risk management [14,16-18]. These gaps in clinical competence may add to the slow development of community pharmacists' contribution to patient care [19,20]. The aim of this study was to identify gaps in community pharmacists' competence in medication risk management in routine dispensing in Finland.

MATERIALS AND METHODS

Study context

In Finland, medicines supply to outpatients is provided by approximately 600 privately owned community pharmacies and by two teaching pharmacies operated by the University of Helsinki and University of Eastern Finland [21]. These pharmacies, with a total number of around 800 outlets and 200 online pharmacies, quite evenly distributed throughout the country, are the only sources of prescription and non-prescription medicines to outpatients.

Community pharmacists in Finland are obliged to ensure appropriate and safe use of medicines while dispensing prescription medicines and selling over-the-counter medicines [22]. This includes checking the appropriateness of the prescription, identifying possible drug-drug interactions and potential duplicate medication therapies, confirming the dose, and monitoring adherence. They are also obliged to counsel the medicine user by giving brief instructions on how to use the medicines. No detailed regulations or standards guide the content of the counselling required. Following the European Union legislation, medicines are dispensed in original labelled packages with inserted package leaflets [23]. As most of the prescriptions are currently valid for two years, patients do not necessarily see their physicians frequently. Instead, they visit community pharmacy regularly at least every three months to refill their prescriptions of long-term therapies, which is allowed by the public reimbursement system [24]. Dispensing and counselling work is primarily performed by pharmacists with a BSc (Pharm) degree. Pharmacy owners must have a MSc (Pharm) degree.

Finnish community pharmacists have been proactively developing their services to ensure safe and rational medicines use. Special focus has been placed on improving medication counselling services [25-28]. Since 2000, this development has been nationally coordinated, involving practitioners, professional organisations, pharmacy schools, continuing education centres and national medical authorities. The cooperation has resulted in innovative practice development, curriculum changes, enhanced continuing and in-house training applying constructive and experiential learning [15]. Development of electronic databases and medication risk management tools has been extensive, and many of them are today routinely available in almost all community pharmacies [29]. Most of these tools are common to all healthcare professionals working in Finnish healthcare. The databases and tools have evolved from product-specific medicines information sources towards systems assisting in prospective medication risk management of individual patients (Table 1). These tools cover, for example, drug-induced adverse reactions, anticholinergic and serotonergic load, potentially inappropriate medicines for older adults, and medication safety during renal or hepatic failure, pregnancy, or lactation. Developments towards patient-care orientation have been supported by continuing education. One of the major milestones in this respect was the initiation of accreditation training for collaborative medication reviews in 2005 [30-32].

DOI: https://doi.org/10.24926/iip.v12i1.3510

Table 1. Evolution of electronic medication risk management databases and tools in Finnish community pharmacies.

Year of launch	Medication risks covered and type of the risk management database
1975 (manual version since 1975, electronic since 1991)	**Statutory medicines information**: Structured product information based on summary of product characteristics (SPC) on formulation, indications, dosage regimens, contraindications, warnings and precautions for use, drug-drug interactions, use during pregnancy and lactation, effects on the ability to drive and use machines, adverse reactions, overdosing, pharmacological properties, preclinical safety data, list of excipients, incompatibilities, shelf life, special precautions for storage, packages and definition of product, handling instructions, and product categorisation according to anatomic-therapeutic-chemical (ATC) classification. The compendium also contains information on product prices and reimbursements through public health insurance. (Pharmaca Fennica®[1]).
2000	**Statutory medicines information in a simplified format**: An electronic checklist-type generic medicines information database integrated into the prescription processing system to support medication counselling, based on statutory medicines information derived from SPCs and package leaflets (Tietotippa®[2]; YA-Helppi®[3])
2004	**Drug-drug interactions** categorised into four classes (A-D) according to their clinical significance. The first version based on a Swedish database (FASS). The current database (Inxbase®[4]) has been extended to also cover clinically significant interactions between medicines and nutrients, and medicines and natural products. The database can be integrated into the patient information system in community pharmacies.
2009	**Medication safety during pregnancy and lactation**. In addition to the actual medicines, the databases also provide safety information on vitamins, trace elements, drugs and common stimulants. (Gravbase®[4], Lactbase®[4]).
2010	**Medicine use in renal failure**. Includes information on safety and detailed dosage recommendations of different medicines and other substances, such as vitamins and micronutrients in patients with renal failure. The database analyses the pharmacokinetics and safety of medicines and substances by dividing them into four categories based on glomerular filtration rate (GFR) and gives recommendations for clinical and laboratory monitoring when prescribing/dispensing a specific agent. (Renbase®[4])
2010	**Potentially inappropriate medications (PIMs) for older adults over 75 years of age.** Contains classifications and recommendations for almost 500 substances or their combination. The medicinal substances are classified into four categories (A-D) indicating how suitable the medicinal substance is for older adults. The categorisation of the medicines is based on commonly used criteria (Beers, STOPP/START, Laroche). The database can be integrated into the patient information system in community pharmacies. (Meds75+®[5]).
2012	**Effectiveness and safety of natural medicines**. Contains a short description of the pharmacological effects of the substance, description of the results from clinical studies, dosing information for different formulations, and description of the traditional use in folk medicine. The safety of the substance (contraindications and adverse effects) is based on the evidence from clinical studies and pharmacoepidemiological and pharmacovigilance data of reported adverse effects. (Herbalbase®[4]).
2012	**Medicine-induced risks and adverse reactions**. An integrated medication risk assessment database to identify pharmacokinetic and pharmacodynamic interactions, anticholinergic, sedative and serotonergic load and potentially inappropriate medications for older adults. The database is specifically designed for community pharmacists to assist in medication reviews. The database can be integrated into the patient information system in community pharmacies. (Salko®[2]).
2013	**Medicine-induced risks and adverse reactions**. A medication risk assessment database that provides a comprehensive risk profile of medicine-induced adverse reactions based on pharmacodynamic properties of the medicines used by the patient. The risks and adverse reactions identified by the database include anticholinergic load, constipation, sedation, orthostatism, risk of bleeding, serotonergic load, risk of seizures, QT prolongation and renal toxicity. It also gives information on potential effects of medication to patients' sodium and potassium values. A complementary database to Inxbase®. (Riskbase®[4]).
2014	**Medicine use in hepatic impairment**. Includes information on the safety and detailed dosage recommendations of medicines and other substances, such as vitamins and micronutrients in patients with hepatic impairment. (Heparbase®[4]).
2016	**Comprehensive review of risks in medication**. Integrated information of patients' medication including indications, contraindications, medicine use in renal failure, serious drug-drug interactions, adverse reactions and laboratory values. (EBMEDS®[6] Lääkityksen kokonaisarvio).

Provider: 1) Pharmaceutical Information Center http://www.laaketietokeskus.fi/en, 2) Association of Finnish Pharmacies (AFP) http://www.apteekkariliitto.fi/en/association.html, 3) University Pharmacy http://www.ya.fi, 4) Medbase Ltd http://www.medbase.fi/en/; available in national health portal Terveysportti, 5) Finnish Medicines Agency, Fimea https://www.fimea.fi/web/en/frontpage, 6) The Finnish Medical Society Duodecim https://www.ebmeds.org/en/, available in national health portal Terveysportti

DOI: https://doi.org/10.24926/iip.v12i1.3510

Study design and method

This was a national cross-sectional online survey targeted at community pharmacies in Finland in October 2015. An invitation to participate in the study was emailed by the Association of Finnish Pharmacies to its member pharmacies (n=574) and by the researchers to both university pharmacies. Reason's Human Error theory with a systems approach served as a theoretical framework of the study [33]. We applied a prospective approach to medication risk management, i.e., risk management actions related to routine dispensing were considered as systemic defences to prevent potential medication-related risks.

Survey instrument

Because no validated survey instrument focusing on the research question was found in the literature, we developed a new one. The development based on 1) existing literature and our vast expertise in medication safety and medication risk management from systems approach in various contexts [34]; 2) practical experience of two community pharmacists, two pharmacists specialised in pharmacy practice research and an expert pharmacist from the Association of Finnish Pharmacies; 3) a self-assessment tool previously developed by our research group targeted to assess pharmacy students' use of medicines information sources during their internship [29], and 4) pedagogic expertise of two research group members in pharmacy curriculum development for undergraduates and life-long learning. Principles of scale development and validation was applied, starting from item development, coming up with the initial set of questions for an eventual scale, and evaluating the eventual scale for content and face validity [35]. The item generation was based on 1) potential medication-related risks in community pharmacy context, 2) resources available for community pharmacists to identify, solve and prevent medication-related risks while dispensing, and 3) understanding of core competences needed in medication risk management and patient-oriented community pharmacy practice [36]. The face and content validity of the survey instrument was assessed by two practising community pharmacists and an expert pharmacist from the Association of Finnish Pharmacies [35]. After including their comments, the survey instrument was piloted by four community pharmacists. Minor clarifications and modifications were made to the questions according to their comments.

The final survey instrument consisted of 18 mainly structured questions with the following two primary objectives: 1) actions taken by community pharmacists to manage medication-related risks in routine dispensing, and 2) competence gaps and development needs in community pharmacists' competence in medication risk management in routine dispensing. From the outset, the results of these two main objectives were planned to be published in two separate reports. The results related to actions taken by community pharmacists to manage medication-related risks in routine dispensing (main objective 1) have been published elsewhere [37].

This paper reports the results of the latter main objective concerning self-assessed competences and possible competence gaps. For this purpose, the survey instrument contained the following three questions aimed at self-assessing medication risk management competences in each respondent's workplace: 1) Competence to identify medication-related risks, 2) Competence to use electronic medication risk assessment tools, and 3) Perceived need for developing competence in medication risk management in routine dispensing (Table 2).

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Table 2. The survey questions to self-assess community pharmacists' competences in medication risk management in routine dispensing and perceived needs for competence development in this respect.

SELF-ASSESSED COMPETENCE TO IDENTIFY MEDICATION-RELATED RISKS IN ROUTINE DISPENSING	
Question 1: What is your estimate of competence of the pharmacists in your workplace in the following risk situations (with or without the help of electronic tools)? • Confirming the dosage of the medicine • Identifying an interaction • Assessing the clinical significance of an interaction • Identifying duplicate medication therapy • Identifying medicine-induced adverse reaction • Identifying PIMs for older adults • Identifying medicine-induced anticholinergic load • Identifying medicine-induced sedative load • Identifying medicine-induced serotonergic load • Therapeutic interpretation of the medication review report by Salko®	**Options to respond to each risk situation:** 1) Competence is good, and it is applied in daily practice 2) Competence is moderate 3) Competence is poor
SELF-ASSESSED COMPETENCE TO USE ELECTRONIC MEDICATION RISK ASSESSMENT TOOLS	
Question 2: What is your estimate of the competence of the pharmacists in your workplace to use the following electronic tools? • Medicines information database basing on SPCs (Pharmaca Fennica®) • Databases to support medication counselling (Tietotippa®; YA-Helppi®) • Medication review tool for community pharmacists (Salko®) • Medication safety in renal failure (Renbase®) • Medication safety in hepatic impairment (Heparbase®) • Medication safety during pregnancy and lactation (Gravbase®; Lactbase®) • Efficacy and safety of herbal ingredients and food supplements (Herbalbase®) • Drug-drug interactions (Inxbase®) • Risk profile of medicine-induced adverse reactions (Riskbase®) • PIMs for older adults (Meds75+®)	**Options to respond to each electronic tool:** 1) Competence is good, and the tool is applied in daily practice 2) Competence is moderate 3) Competence is poor 4) The medication risk management tool is not available in our pharmacy
PERCEIVED NEED FOR DEVELOPING COMPETENCE IN MEDICATION RISK MANAGEMENT IN ROUTINE DISPENSING	
Question 3: In which of the following issues continuing education is needed in your pharmacy (you may choose several options)? • Clinical interpretation of patient information/laboratory tests A structured list of: • Risk situations (the same list of risk situations as in Question 1) • Medication risk management tools (the same list of electronic tools as in Question 2)	**Options to respond to each issue:** Respondents were guided to choose as many options as applicable

SPC=Summary of Product Characteristics; PIMs=Potentially Inappropriate Medications. See Table 1 for details of medication risk management databases and tools.

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Data collection and analysis

The survey was carried out by using University of Helsinki's E-form application [38]. The invitation to participate in the study was e-mailed to pharmacy owners' personal email addresses with instructions to choose one pharmacist to respond on behalf of their outlet. The response time was three weeks during which two reminder e-mails was sent to the invitees. Descriptive statistics were applied for data analysis. Frequencies and percentages were calculated using IBM SPSS Statistics version 22.0 [39].

Ethical considerations

The study was conducted according to research ethics guidelines by the Finnish National Advisory Board on Research Integrity [40]. Respondents were informed about the purpose of the study and that their anonymous responses would only be used for research purposes. Responding to the survey was considered as informed consent for participation as it was voluntary.

RESULTS

Responses were received from 171 community pharmacies. Two of the responses were excluded because of an unidentified technical error in electronic recording of the responses. Thus, 169 responses were included in the study, yielding a response rate of 29%. A majority (80%) of the respondents were pharmacy owners (43%) or manager pharmacists (37%) running small or middle-sized pharmacies in terms of annual prescription volume (Table 3).

Table 3. Respondents and their community pharmacies (n=169). The percentages in brackets refer to all community pharmacies in Finland (n=574) at the time of the survey (date of the statistics Dec 31, 2014). Data source: The Association of Finnish Pharmacies.

	n	%
Work title and degree		
Pharmacy owner, MSc (Pharm)	72	43 (12)
Pharmacist, manager, MSc (Pharm)	63	37 (15)
Dispensing pharmacist, BSc (Pharm)	34	20 (73)
Annual prescription volume in 2014		
< 60,000	74	44 (43)
60,000–100,000	57	34 (32)
> 100,000	38	22 (25)
Location		
Southern Finland	51	30 (n/a)
Western Finland	70	41 (n/a)
Eastern Finland	21	13 (n/a)
Northern Finland	27	16 (n/a)

Pharmacists' competence to identify potential medication-related risks while dispensing

The responding pharmacists (n=169) estimated the competence of their workplace pharmacists mainly as good or moderate in all competence areas listed in the survey instrument concerning identification of potential medication-related risks while dispensing (Figure 1). The highest proportion of good competence estimates was reported for confirming doses (98%) and identifying drug-drug interactions (83%). However, less than half (48%) estimated that the competence to assess clinical significance of interactions was good in their pharmacy. The lowest proportion of good competence estimates was reported for identifying adverse drug effects such as serotonergic load (10%), anticholinergic load (12%) and sedative load (26%). Around the same proportion of the informants (11%) estimated their workplace competence as good for interpreting the clinical importance of the findings of a medication risk assessment processed by an electronic risk assessment programme. Less than a quarter (23%) reported having good competence for identifying potentially inappropriate medications for older adults.

DOI: https://doi.org/10.24926/iip.v12i1.3510

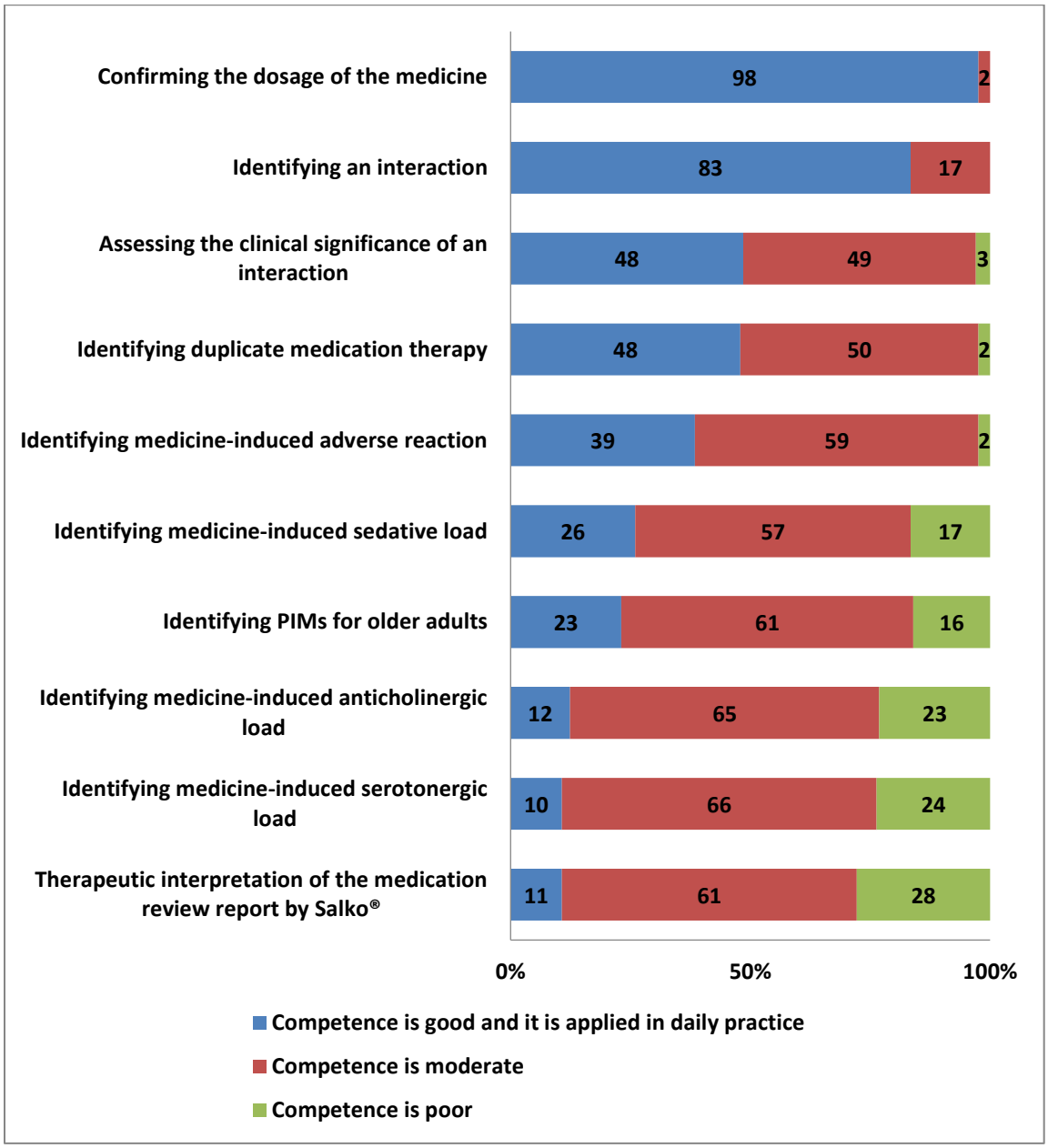

Figure 1. Informant pharmacists' (n=169) estimates of competences of pharmacists at their workplace to identify potential medication-related risks while dispensing. PIMs=Potentially Inappropriate Medications. Salko®=A medication review tool for community pharmacists. See Table 1 for details.

Pharmacists' competence to use medication risk management databases and tools while dispensing

According to the informant pharmacists (n=169), their peers at the workplace most commonly had good competence in using three of the medicines information and medication risk management databases included in the study (Figure 2). These databases were: 1) the product-specific medicines information database containing statutory information from summaries of product characteristics (SPCs) 2) the checklist-type generic medicines information database that supports in medication counselling; and 3) the database assisting in identifying drug-drug interactions. The informant pharmacists reported to have good competence in using these three databases in daily dispensing at rates of 97%, 85%, and 83%, respectively. Good competence to use other databases, mainly designed to assist in managing medication-induced adverse effects, was less common. For example, 19% of the informants reported that the pharmacists at their workplace had good competence to use a tool to assess risk profile of medicine-induced adverse reactions from the medication regimens of their clients, and 14% to use the same kind of tool specifically designed to be used by community pharmacists. More than half of the informants reported not having access to databases assisting with managing risks related to renal impairment (56%) or hepatic impairment (58%).

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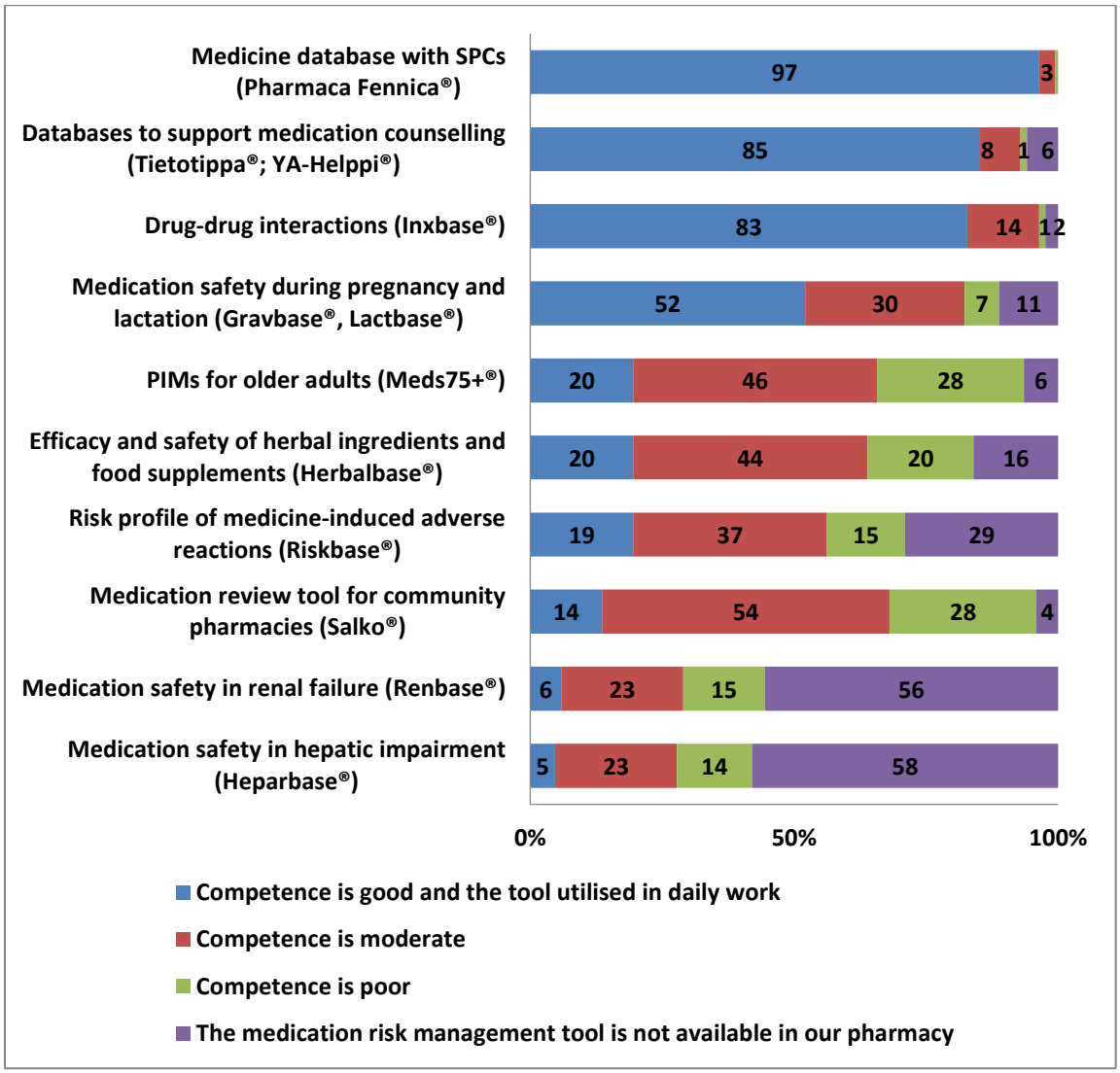

Figure 2. Informant pharmacists' (n=169) estimates of competences of pharmacists at their workplace to use medication risk management tools and databases while dispensing.
SPC=Summary of Product Characteristics; PIMs=Potentially Inappropriate Medications.

Perceived need for competence development in medication risk management

According to the informant pharmacists (n=169), the highest need for competence development in their pharmacies concerned applied clinical pharmacotherapy, particularly the identification of medication-induced adverse reactions such as serotonergic load (63%), anticholinergic load (62%) and sedative load (49%) (Figure 3). More than half of the informants also indicated a desire to learn more about assessing clinical significance of interactions (54%), interpreting patient information such as laboratory values (54%) and identifying potentially inappropriate medications (54%). Fewer informants indicated a need to improve competences to use medication risk management databases and tools than to identify potential medication-related risks. Concerning the use of the databases, most commonly reported training needs focused on databases with medication-related recommendations for older adults (36%), the tool assisting in medication reviews designed and only available for community pharmacies (33%), the tools for assisting in medication management in renal and hepatic impairment (both 31%), and a tool for assessing risk profile of medicine-induced adverse reactions from the entire medication regimen of the client (30%).

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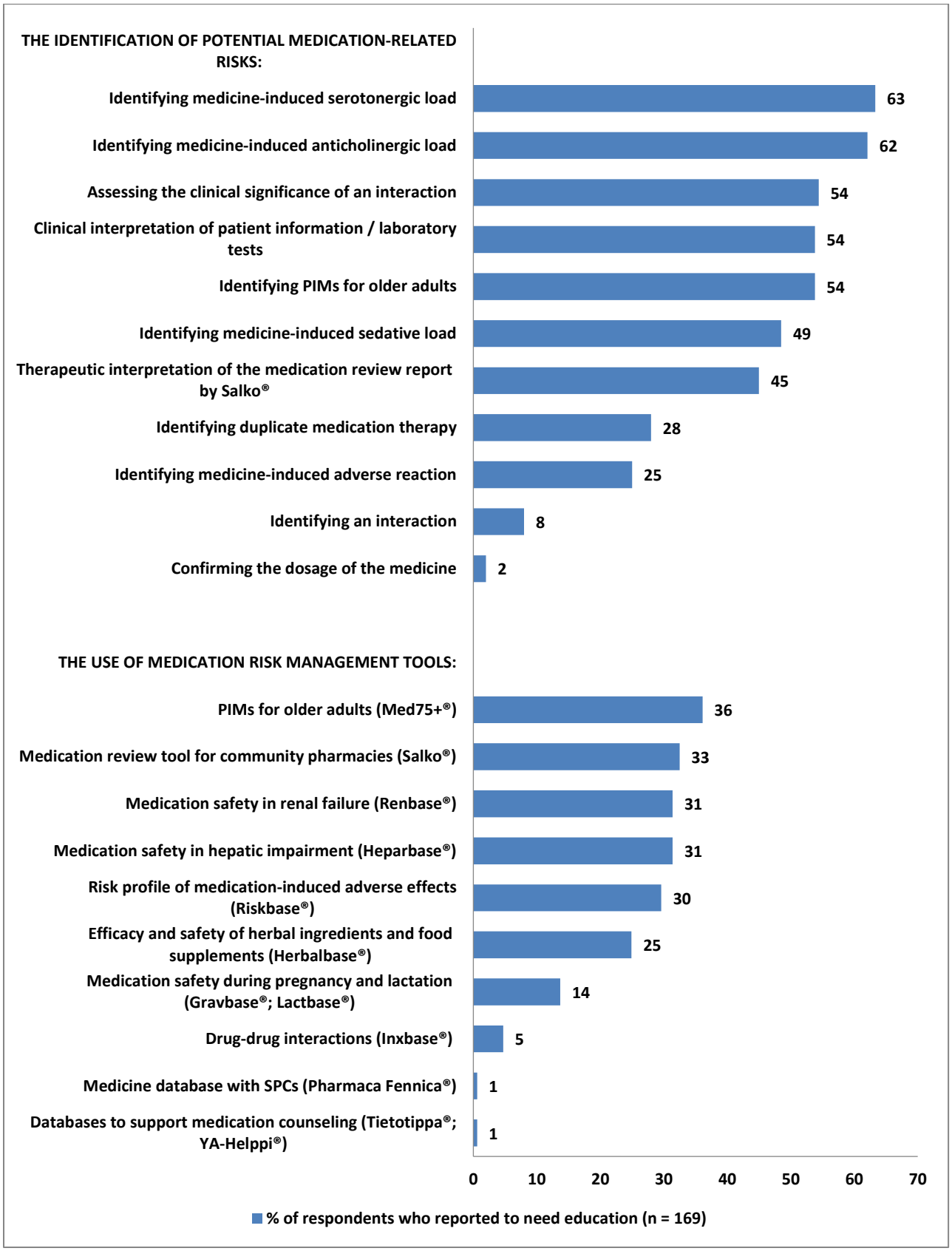

Figure 3. Informant pharmacists' (n=169) estimates of the competence development needs in their workplace concerning the identification of potential medication-related risks and use of medication risk management tools.
PIMs=Potentially Inappropriate Medications. SPC=Summary of Product Characteristics.

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DISCUSSION

This nationwide study indicates that there are remarkable gaps in community pharmacists´ competence in medication risk management in routine dispensing. The major gaps related to applied clinical and geriatric pharmacotherapy and reviewing medications, as well as using medication risk management databases. The competence gaps with the use of the risk management tools concerned: 1) skills to use the tools, and 2) to interpret and apply patient-specific risk information into practice. Pharmacists' self-assessed needs for continuing education in medication risk management were in line with the competence gaps identified.

In this study, pharmacists reported having good competence for confirming prescribed dosages and identifying drug-drug interactions. Similar findings have been reported in previous studies [1,41,42]. These are risk management actions that pharmacists are required to perform while dispensing. Therefore, these are actions they perform most commonly as was also shown in our previous study based on the same survey data than the present study [37]. According to its results, 82% of the responding pharmacies reported checking drug-drug interactions of all patients while dispensing, and 73% reported systematically confirming the prescribed dosages. Thus, competence gaps seem to reflect current actual medication risk management practices in community pharmacies. Previous studies from Australia and Croatia suggest that pharmacists with better clinical skills identify and solve more medication-related problems than their colleagues with poorer skills [10,17]. These findings indicate that pharmacists' clinical skills determine the extent to which they can contribute to patient care.

Our findings indicate remarkable gaps in community pharmacists' competence to identify potentially inappropriate medicines for older adults, anticholinergic or sedative load in medications, and medicine-induced adverse reactions. These competences are particularly important in geriatric pharmacotherapy, and their need has become more dominant as an increasing proportion of pharmacy customers are older people who have long-term conditions and multiple medications [36,44]. As medications have become more complex, their management has become more challenging for all health professionals. In addition to this, increased awareness of age-related medication risks, such as potentially inappropriate medications for older adults and effect of renal dysfunction on medication concentrations, have increased the expectations of medication risk management and optimisation [2]. As community pharmacists become more involved in the medication risk management, their competencies need to be improved. Like previous studies from Finland, this study indicates an urgent need to invest in improving competences in applied geriatric pharmacotherapy [15].

This study also indicates gaps in competences to clinically interpret the information received from the electronic databases and apply the received information into practice. According to our results, more than half of the pharmacists may not have the appropriate skills even to assess the clinical significance of the interactions that they have identified through the drug-drug interaction database. This not only seems to be situation in Finland but also in other countries [41,43]. Newer medication risk management tools and databases can help pharmacists to identify, for example, medication-induced risk loads and potentially inappropriate medications for older adults (Table 1). The question is how well pharmacists are capable of making use of these advanced tools.

These results suggest that the implementation of electronic risk management databases and tools alone is not sufficient, but further efforts are needed to enhance community pharmacists' understanding of the therapeutic information databases provide and the skills to interpret patient-specific therapeutic significance of this information. These competence gaps have been taken into consideration in the current pharmacy curriculum in Finland. Since 2017, all new pharmacy graduates have been taught basic competences in medication reviews according to nationally set competence criteria [45]. The challenge is how to cover the competence gaps of practising pharmacists. This is a challenge even though community pharmacists in Finland have a well-organised continuing education system, with a tradition of long-term education and online learning. Accreditation training in comprehensive medication reviews has been available since 2005 [46]. Despite these opportunities and active pharmacists' participation, the training may still reach only a minority of the practising pharmacists. The training requires a long-term and financial commitment, also strategic commitment from pharmacy owners as employers [47]. Even though pharmacists as a profession may globally share the common goal of being more involved in patient care the real-life practice may still need development to reach the goal [48,49].

The identified competence gaps may perform as a root cause for the lack of breakthrough of clinical community pharmacy services in Finland and beyond [19,20]. Overcoming these competence gaps requires nationally planned and coordinated systematic continuing education programmes that are easily accessible for all practising pharmacists regardless of their geographic location or employer support. Pedagogically well-designed massive open online courses (MOOCs) could provide one solution if financially supported by key stakeholders in pharmacy and pharmacy owners. These educational programmes should be planned so that they support implementation of actual healthcare-oriented services, not just provide theoretical knowledge.

The main limitation of this study is a low response rate (29%) which affects the generalisability of the results. Thus, the results can be considered as indicative providing ideas of practicing pharmacists' competence gaps to be met in Finland where the survey was conducted. The questionnaire we developed could be used in other countries to survey

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medication risk management practices and competences of community pharmacists.

Most likely the data in our study are skewed towards the community pharmacies that are committed to healthcare-oriented services. This assumption is supported by the fact that the survey was emailed to pharmacy owners and most of the actual informants were owners themselves who responded on behalf of all pharmacists working in their pharmacy. If they were interested in community pharmacists' involvement in medication risk management, they were motivated to respond to the survey. As the study was carried out as self-assessment, it can cause bias because of over- and under-estimation of own practices [50]. As this was the first indicative study, we did not evaluate variations in individual pharmacists' competences, but focused on obtaining a general overview of competences in medication risk management in pharmacies. The study identified competence gaps and educational needs of practising pharmacists, providing basis for developing education and competence in the future. Future research should examine identified competence gaps in more detail to find out ways for overcoming them.

CONCLUSIONS

There are remarkable gaps in community pharmacists' current competence in medication risk management, particularly in their competence in applied and geriatric pharmacotherapy. Overcoming these competence gaps requires well-planned and coordinated systematic continuing education programmes that are easily accessible for all practising pharmacists regardless of their geographic location or employer support. Overcoming the gaps may also facilitate the breakthrough of community pharmacists' involvement in medication risk management in patient care.

Acknowledgements: We thank the Association of Finnish Pharmacies for their help in conducting the survey.

Funding: Sonja Kallio has received research grant from the Association of Finnish Pharmacies.

Conflicts of Interest: None.

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