


# Fostering medication review competence of pharmacy students: An assessment by students and their preceptors after advanced-level practical internship

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**Aims:** The aim of this study was to introduce a new assessment method for pharmacy students' real-life competence in reviewing medications after obligatory advanced-level practical internship in Finland.

**Methods:** The new medication review (MR) competence assessment method consisted of (1) a self-assessment by pharmacy students and (2) a performance assessment by their MR specialized preceptors at the completion of the advanced-level pharmacy internship during the third study year at the University of Helsinki, Finland. The assessment applied a structured and validated electronic evaluation tool based on national MR competence recommendations for pharmacists (31 items).

**Results:** Altogether 378 students and their MR preceptors assessed students' MR competence during the period of November 2020–December 2023. Majority of the students self-assessed their MR competence as very good (25%) or good (70%). Preceptors' estimates for students' MR competence were higher, as they graded 54% of the students with the grade very good and 43% with the grade good. Differences between students' and preceptors' assessments were statistically significant ( $p < .05$ ) in all other statements except for 'Understands the importance of medication reconciliation and prescription review in improving medication safety and outcomes' ( $p = .829$ ). The preceptors tended to assess students' MR competence as better than students themselves.

**Conclusions:** Combining self-assessment and assessment by an MR specialized preceptor forms a feasible method for assessing the real-life MR competence of students after advanced-level pharmacy internship. The involvement of the students' and preceptors' assessments can balance the effect of over- and under-estimation of the competence.

## KEYWORDS

assessment of learning, clinical pharmacy, curriculum development, medication review, pharmacy education, pharmacy internship

The authors confirm that the PI for this paper is Marja Airaksinen.

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## 1 | INTRODUCTION

Pharmacotherapies have become increasingly important in maintaining health, preventing illness, managing chronic conditions and curing diseases.<sup>1,2</sup> The proliferation of drug treatments in patient care has created new competence needs for all healthcare professionals to optimize medication use and ensure population health outcomes. For pharmacists these changes have created a societal need to shift their practice from dispensing and related medication counselling towards care-oriented practice and involvement in care teams in various social and healthcare settings.<sup>3-11</sup> The shift towards patient care-oriented pharmacy practice has been strongly promoted by international professional organizations with the support of the World Health Organization WHO.<sup>12</sup> Pharmacy education is seen as instrumental in ensuring that future pharmacy professionals will have the clinical competencies required in working life.<sup>13-15</sup> Theoretical and practical training comprise an underlying foundation to prepare students for the future working life requirements as also recently stated by EU Commission.<sup>14,16-18</sup>

The change in the pharmacists' working profile towards a more clinical and patient-centred direction requires such clinical competence that, for example, community pharmacists do not routinely have without additional training.<sup>19-26</sup> Among the new core pharmacy practice areas requiring advanced clinical pharmacotherapy skills are medication reviews (MRs), that is, a structured evaluation of a patient's medication regimen with the aim of optimizing medicines use and improving health outcomes.<sup>3,27,28</sup> This entails identifying and solving medication-related problems and recommending interventions to prospectively prevent risks and problems that could harm the patient. Pharmacists' involvement in conducting collaboratively MRs requires new expertise ranging from understanding the disease management process to knowing how to create and optimize medication regimens for individual patients, taking into consideration self-management and follow-up of the medication.<sup>19-21,27</sup> Learning from real patient cases is essential to apply theoretical knowledge into practice.<sup>26</sup> Students' competence level should be assessed at relevant stages to ensure that they have acquired skills required in patient care-oriented practice.<sup>14</sup> The aim of this study was to introduce a new assessment method for pharmacy students' real-life MR competence after obligatory advanced-level pharmacy internship by combining students' self-assessment and assessment by their MR-specialized preceptors.

## 2 | METHODS

### 2.1 | Context of the study

Discussion about the necessity of engaging pharmacists in conducting MRs started in Finland in the beginning of 2000s during a long-term national programme supporting community pharmacies to change their medication counselling practices more customer-oriented.<sup>20,29</sup> The programme evaluation found that not all drug-related problems identified by enhanced counselling could be solved

by giving advice. That notion led to the initiation of a national long-term continuing education (CE) programme for comprehensive medication review (CMR) accreditation for practising pharmacists in 2005.<sup>19,20</sup> Since then, MRs and other clinical pharmacy services have become more common in outpatient and hospital settings,<sup>30,31</sup> extending most recently to geriatric care units in primary care and social services.<sup>32,33</sup>

The Faculty of Pharmacy, University of Helsinki, was the first pharmacy school in Finland to incorporate MR expertise in the undergraduate curriculum when it carried out the latest major curriculum reform in 2014.<sup>34</sup> As a part of the reform, MR expertise was incorporated across the BSc (Pharm) curriculum, which is a 3-year pharmacy degree in a two-tier EU-harmonized higher education system.<sup>17,35-37</sup> The first students with MR expertise graduated in 2017. During the theoretical studies at the university, pharmacy students acquire basic MR competencies. An obligatory 6-month internship (30 ECTS credits) plays a significant role in applying this theoretical knowledge into practice.<sup>13,38,39</sup> In Finland, the internship is divided into two 3-month periods and integrated into professional studies during the second and third academic year.<sup>17,36,40</sup> The first 3-month internship period is for learning basic pharmaceutical tasks (e.g. in dispensing and patient counselling), and the second period is for acquiring skills needed in more advanced-level pharmaceutical tasks, particularly in reviewing and optimizing medication regimens in real-life practice. Students' learning is supported by reflective assignments organized as workbooks covering the core contents of each internship period.<sup>36,41</sup> During the second, more advanced-level internship, students conduct at least one reported MR to a real patient under supervision of an MR specialized preceptor who is involved in all stages of the MR process. After completing the MR process, students self-assess their MR competence and preceptors assess students' MR competence. Then the MR preceptor and the student will go through the results of the assessment. The joint discussion and feedback from the preceptor enhance student learning by enabling to identify personal strengths and development targets for continuous learning. MR competency assessment is recommended to be carried out at the end of the second internship period.

### 2.2 | Criteria for MR competence assessment

The national MR competence recommendations for pharmacists<sup>42,43</sup> were used as criteria for the new MR competence assessment procedure developed for students (Appendix S1). The criteria were established in 2017 by a national coordination group consisting of key stakeholders in pharmacy.<sup>42,43</sup> The recommendations follow the British National Health Service (NHS) model of three types of MRs,<sup>44</sup> covering competencies for prescription reviews, MRs and CMRs.<sup>42,43</sup> CMR is the highest competence level, requiring accreditation training that goes beyond the competence acquired in the undergraduate education.<sup>20,42,43</sup> Competencies related to disease and medication self-management, adherence and follow-up are included in each level of the reviews.

## 2.3 | Data collection

The new MR competence assessment procedure developed for students consisted of (1) a self-assessment by third-year pharmacy students and (2) an assessment of performance by their MR specialized preceptors at the completion of the 3-month advanced-level community pharmacy internship at the University of Helsinki. During the internship, students were assigned to conduct an MR to a real patient under supervision of a preceptor who was either a physician or pharmacy practitioner with clinical pharmacy specialization (i.e. expertise in MRs and CMRs or in clinical hospital pharmacy). The MR competence was self-assessed as an obligatory assignment after completion of the MR assignment. The students and their preceptors independently assessed the MR competence using a structured evaluation tool based on the national MR competence recommendations for pharmacists,<sup>42,45</sup> minorly modified and validated by Lias et al (Appendix S1). The assessment tool consisted of 20 items for prescription review competence and 11 additional MR specific items.<sup>43</sup> A 5-point Likert scale, ranging from 1 (*very poor/not at all*) to 5 (*very good*, signifying grade A or outstanding/excellent achievement), was used for assessing each item. The assignment with a link to the electronic self-assessment tool (e-Form, version 3) was included in the students' workbook.<sup>46,47</sup>

In addition to the validated national MR competence criteria,<sup>42,43</sup> the self-assessment tool contained two sets of items to self-assess students' competence in (1) disease self-management and follow-up and (2) managing use and follow-up of selected commonly used medicines. For that purpose, the experiential learning faculty at the University of Helsinki created a selected list of common diseases ( $n = 9$ ), and medicines ( $n = 19$ ) considered requiring special monitoring or risk management. The list was based on the common chronic diseases in Finland,<sup>48</sup> high-risk medications in ambulatory healthcare identified by the Institute for Safe Medication Practices<sup>49</sup> and high-risk over-the-counter medications nationally identified by the Finnish Centre for Client and Patient Safety.<sup>50</sup> The list was adapted to contain medicines commonly used in outpatient care in Finland. The list also contained biological medicines, because the implementation of their automated substitution in the community pharmacy was at the planning phase while the MR competence assessments used as data for this study were conducted during November 2020–December 2023.

## 2.4 | Statistical analysis

The data were analysed using the Statistical Package for the Social Sciences software (SPSS version 29). Descriptive statistics are presented as percentages, means, standard deviations and a summative scale. The comparison of individual students' and their preceptors' assessments of students' prescription review and MR competence was made using a non-parametric Wilcoxon signed rank test. The summative variable, competence score, was formed by calculating students' self-assessments and their preceptors' assessments for each of

**TABLE 1** The score limits when forming the summative variables for prescription review ( $n = 20$ ) and medication review (additional 11 competency statements,  $n = 31$ ) competences. Competence scores were categorized using five grades so that grade 1 represented very poor competence, grade 2 poor competence, grade 3 moderate competence, grade 4 good competence and grade 5 very good competence (very good signifying grade A/excellent or outstanding achievement).

Grade	Score range	
	Prescription review	Medication review
1 (very poor)	20–35	31–55
2 (poor)	36–51	56–80
3 (moderate)	52–68	81–105
4 (good)	69–84	106–130
5 (very good)	85–100	131–155

the 31 individual MR competency items.<sup>43</sup> Each competence score could range from 1 to 5, depending on the assessment estimate. Thus, the total competence score range for 31 items was 31–155. Competence scores were categorized into five grades so that competence scores 31–55 corresponded grade 1 (very poor competence); 56–80 corresponded grade 2 (poor competence); 81–105 corresponded grade 3 (moderate competence); 106–130 corresponded grade 4 (good competence); and 131–155 corresponded grade 5 (very good competence, very good signifies grade A/excellent or outstanding achievement) (Table 1).

## 2.5 | Research ethics

The study was conducted in accordance with the guidelines of the Finnish National Advisory Board on Research Integrity<sup>51</sup> and Ethical Review Board in the Humanities and Social and Behavioural Sciences, University of Helsinki.<sup>52</sup> According to these research ethics guidelines, this study was deemed exempt from requiring formal ethics committee approval. The students and their MR preceptors were informed before completing the assessment that their anonymous responses will be utilized for research purposes for curriculum development. They were informed of the option for declining their responses to be included in the study. The data management followed good scientific practices and valid data protection regulations.

## 3 | RESULTS

Altogether 378 students and their 213 MR preceptors covering the entire student population assessed students' MR competence during the 3-year period of November 2020–December 2023 (Table 2). Each preceptor assessed 1–15 students. Most of the students (79%) were pursuing a BSc (Pharm) degree as their final degree and had completed their second obligatory, advanced-level internship period in a

**TABLE 2** Characteristics of the pharmacy students ( $n = 378$ ) who self-assessed their MR competence and the preceptors ( $n = 213$ ) who assessed the students' MR competence at the completion of the 3-month advanced-level pharmacy internship during November 2020–December 2023. Each preceptor assessed 1–15 students.

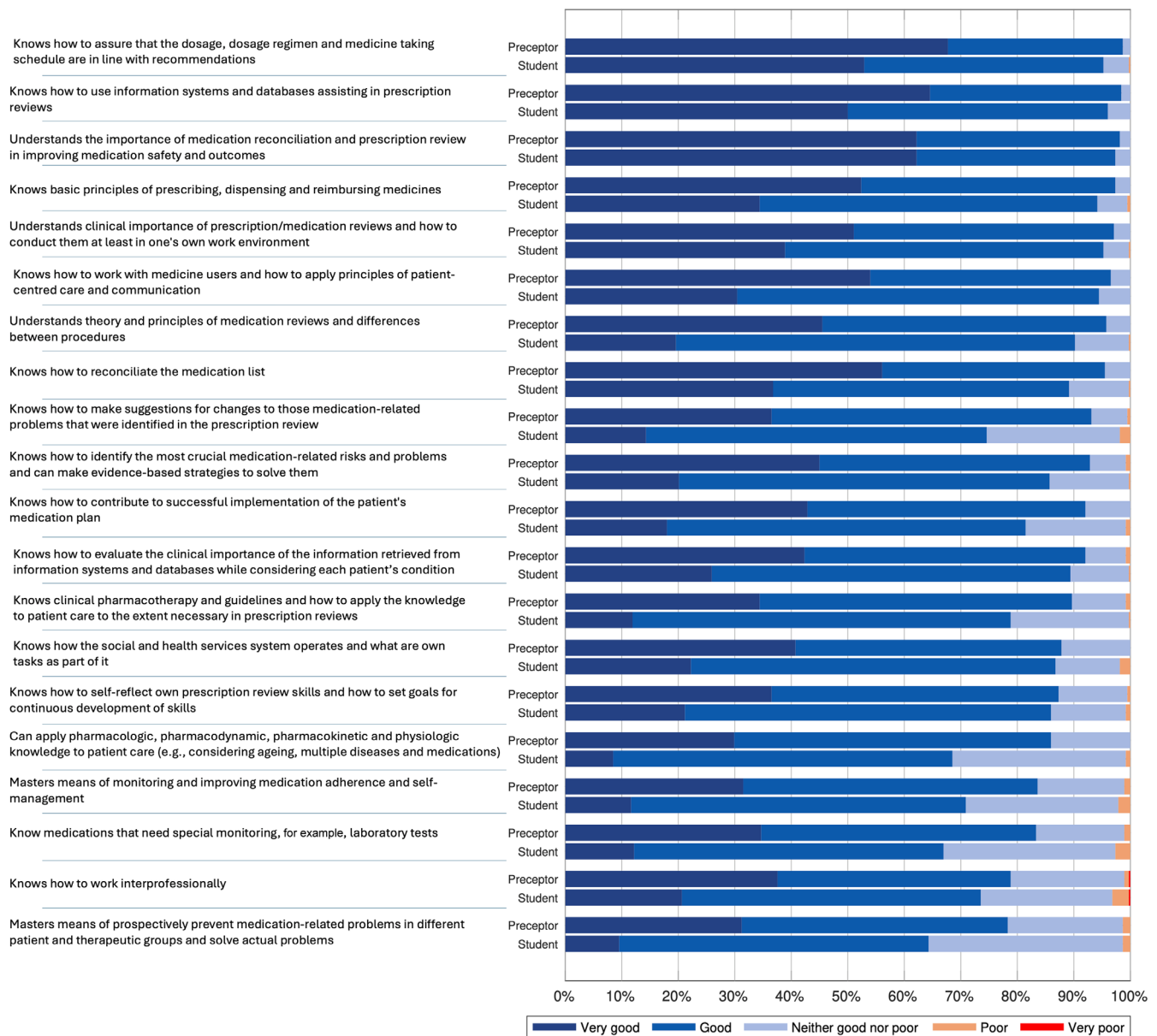
Variable (students)	<i>n</i>	%
<b>Gender</b>		
Female	307	81.2
Male	67	17.7
Non-binary/do not want to tell	4	1.1
<b>Curriculum</b>		
Bachelor's degree	299	79.1
Master's degree	79	20.9
<b>The internship period took place</b>		
In a community pharmacy	331	87.6
In a hospital pharmacy	47	12.4
<b>The number of conducted medication reviews during the internship period</b>		
One	305	80.7
Two	58	15.3
Three	8	2.1
Four	0	0
Five or more	7	1.9
<b>Tutoring took place</b>		
On-site	259	68.5
Remotely	65	17.2
Both on-site and remotely	54	14.3
<b>Previous degree</b>		
No previous degrees	251	66.4
Vocational qualification, healthcare related	9	2.4
Vocational qualification, no healthcare related	73	19.3
Bachelor's degree, healthcare related	6	1.6
Bachelor's degree, no healthcare related	14	3.7
Master's degree, healthcare related	3	0.8
Master's degree, no healthcare related	9	2.4
PhD or equal, healthcare related	2	0.5
PhD or equal, no healthcare related	1	0.3
Other	10	2.6
<b>Grades in obligatory courses laying foundation in clinical pharmacy (grades 1–5, 5 being the highest)</b>		
	<b>Mean grade</b>	<b>SD</b>
Medication counselling and pharmacotherapy (4 ECTS credits)	4.3	0.7
Pathology and nutrition (4 ECTS credits)	2.8	1.1
Systematic pharmacology (12 ECTS credits)	2.9	1.3
<b>Has the student completed the elective course <i>Comprehensive medication review and clinical pharmacy</i> (5 ECTS credits)</b>		
Yes	9	2.4
No	369	97.6

(Continues)

**TABLE 2** (Continued)

Variable (preceptors)		
<b>Gender</b>		
Female	185	86.9
Male	28	13.1
<b>Education</b>		
BSc (Pharm)	164	77
MSc (Pharm)	45	21.1
Lic (Pharm)	1	0.5
PhD (Pharm)	1	0.5
Lic (Med)	2	0.9
Other degree		
No other previous degrees	151	70.9
Vocational qualification, healthcare related	8	3.8
Vocational qualification, no healthcare related	23	10.8
Bachelor's degree, healthcare related	4	1.9
Bachelor's degree, no healthcare related	10	4.7
Master's degree, healthcare related	2	0.9
Master's degree, no healthcare related	11	5.2
PhD or equal, no healthcare related	4	1.9
<b>Specialization</b>		
Medication reviews	148	69.9
Comprehensive medication reviews	41	19.2
Clinical ward pharmacy	2	0.9
Other	22	10.3
<b>The year of completing the specialization training</b>		
2010 or earlier	19	9
2011–2016	17	8
2017–2023	177	83
<b>Frequency of conducting medication reviews as a part of work</b>		
Not at all	40	18.8
Less than monthly	117	54.9
Monthly	37	17.4
Weekly	10	4.7
Daily	9	4.2
<b>Work experience in patient oriented/clinical tasks (years)</b>		
0	4	1.9
1–3	91	42.7
4–6	21	9.9
7–10	23	10.8
More than 10	74	34.7

community pharmacy (88%). A majority (70%) of the preceptors had MR expertise and had completed the expertise training in 2017 or after (83% of the preceptors with MR expertise). Most of the students (66%) and the preceptors (71%) had pharmacy as their only professional degree; they had not completed a previous academic, professional or vocational degree.

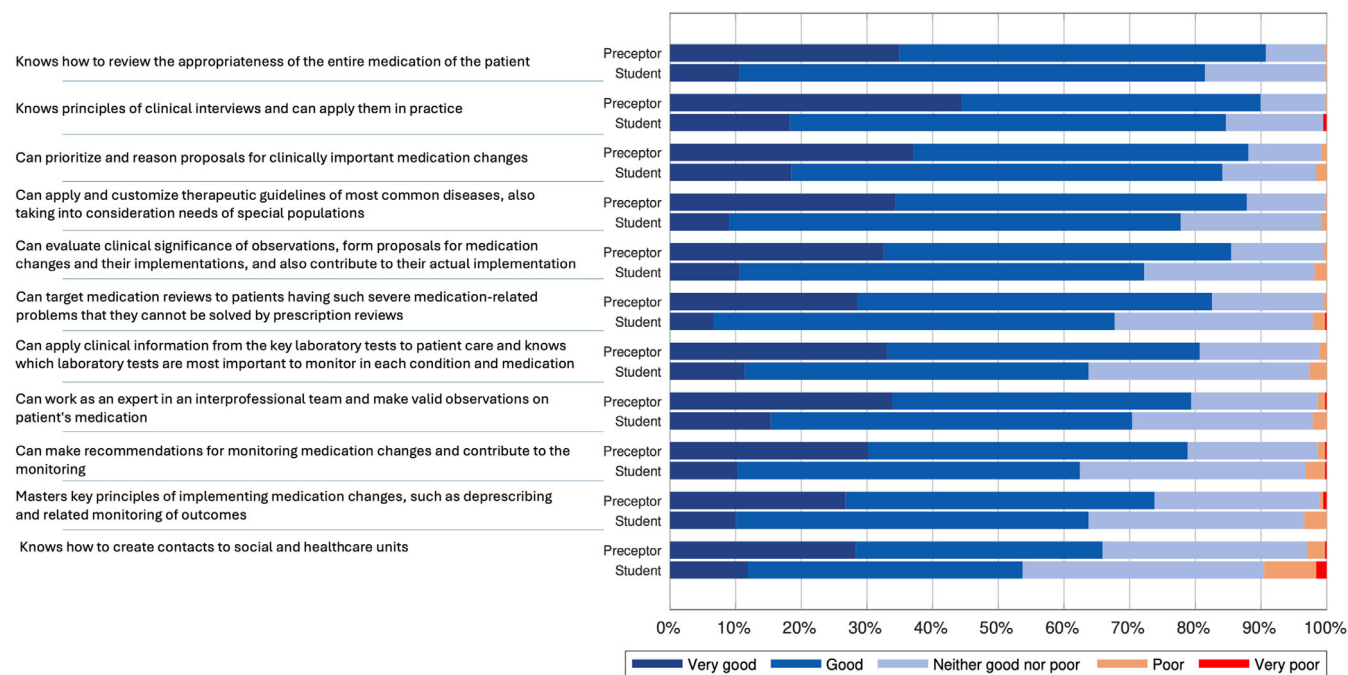


**FIGURE 1** Students' ( $n = 378$ ) and their preceptors ( $n = 213$ ) assessment of students' competencies required for prescription reviews (20 competency statements, % of the respondents). Each preceptor assessed 1–15 students.

### 3.1 | Prescription review competence

A high proportion of students self-estimated their competence as very good or good in most of the 20 competency areas required for conducting prescription reviews (Figure 1). Also, preceptors estimated their students' competence as very good or good, but consistently with higher estimates compared to the students' self-estimates (Figure 1). A low proportion of students and preceptors estimated the students' competence as 'neither good nor poor' or 'poor'. The highest proportion of very good or good competency self-estimates was found in (1) knowing how to assure that the dosage, dosage regimen and medicine taking schedule are in line with recommendations (99% of the preceptors and 95% of the students

had an estimate of very good or good competency); (2) knowing how to use medicines information systems and databases assisting in prescription reviews (98% and 96%); and (3) understanding the importance of medication reconciliation and prescription review in improving medication safety and outcomes (98% and 97%). The lowest proportion of very good or good competency self-estimates concerned: mastering means of prospectively preventing medication-related problems in different patient and therapeutic groups and solving actual problems (78% of the preceptors and 64% of the students had an estimate of very good or good competency); knowing how to work interprofessionally (79% and 74%); and knowing medications that need special monitoring, for example, laboratory tests (83% and 67%) (Figure 1).



**FIGURE 2** Students' ( $n = 378$ ) and their preceptors ( $n = 213$ ) assessment of students' competencies required for medication reviews (MRs) ( $n = 11$ ) in addition to those required for prescription reviews ( $n = 20$ ; Figure 1) (% of the respondents). Each preceptor assessed 1–15 students.

### 3.2 | MR competence

Of the 11 competency items specific to MRs, the highest proportion of very good or good competency self-estimates were found for (1) knowing how to review the appropriateness of the medication regimen of the patient (99% of the preceptors and 95% of the students had an estimate of very good or good competency); (2) knowing principles of clinical interviews and how to apply them in practice (90% and 85%); and (3) prioritizing and reasoning proposals for clinically important medication changes (88% and 84%) (Figure 2). The lowest proportion of very good or good competency self-estimates concerned: knowing how to create contacts to social and healthcare units (66% of the preceptors and 54% of the students had an estimate of very good or good competency); mastering key principles of implementing medication changes, such as deprescribing and related monitoring of outcomes (74% and 64%); and making recommendations for monitoring medication changes and contributing to the monitoring (79% and 62%). In all other statements, the differences between students' and preceptors' assessments were statistically significant ( $p < .05$ ) except for 'Understands the importance of medication reconciliation and prescription review in improving medication safety and outcomes' ( $p = .829$ ).

A majority (95%) of students achieved a grade of very good (25%) or good (70%) in summative competence scores from competence self-estimates (Figure 3). Summative competence scores from preceptors' estimates were higher: A grade of very good was achieved for 54% of the students and good for 43% of the students. Moderate was the lowest grade earned based on summative competence scores (5% of the students' self-estimates, 3% of the preceptors' estimates).

### 3.3 | Competency in disease self-management and follow-up (students' self-estimates)

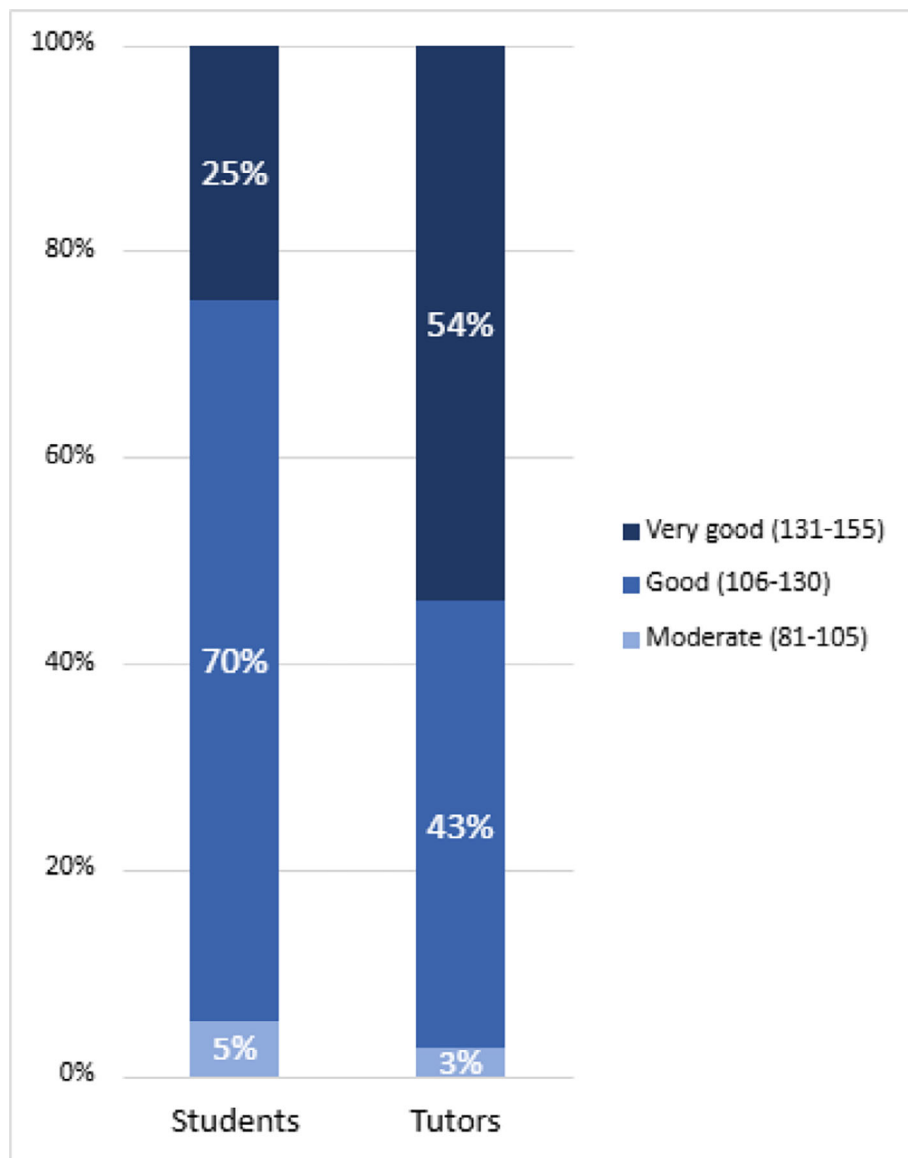
Of the diseases ( $n = 9$ ), the highest proportion of very good or good competency self-estimates were found for hypertension (94% of the students had a self-estimate of a very good or good competency), followed by allergy (84%), type 2 diabetes (82%) and asthma (79%) (Figure 4). The lowest proportion of very good or good competency self-estimates concerned COPD (42%), memory disorders (42%) and metabolic syndrome (45%).

### 3.4 | Competency in management and follow-up of selected medicines (students' self-estimates)

Of the 19 medications, the highest proportion of very good or good competency self-estimates were found for paracetamol (acetaminophen) (97% of the students had a self-estimate of a very good or good competency), non-steroidal anti-inflammatory drugs (NSAIDs) (97%), proton pump inhibitors (PPIs) (89%) and statins (89%) (Figure 5). The lowest proportion of very good or good competency self-estimates concerned digoxin (38%), carbamazepine (38%) and biological drugs and biosimilars (44%).

## 4 | DISCUSSION

According to our experience, combining self-assessment and assessment by an MR specialized preceptor is a feasible method for

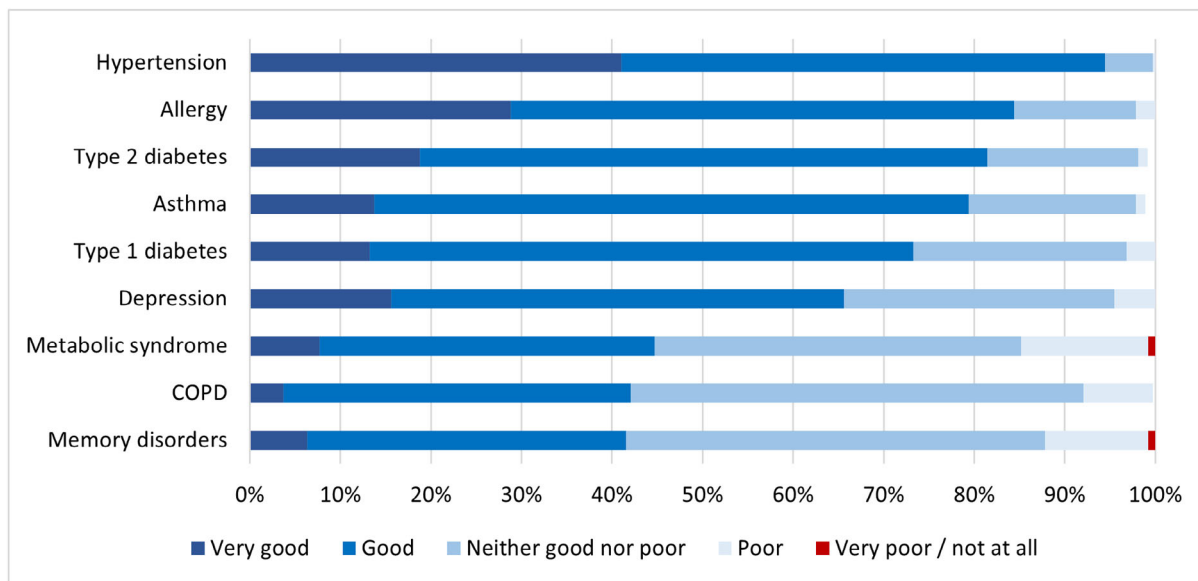


**FIGURE 3** The summative competence score for medication reviews (31 competence statements) based on the students' self-assessments ( $n = 378$ ) and their preceptors' ( $n = 213$ ) assessments covering performance of all the students. Each preceptor assessed 1–15 students.

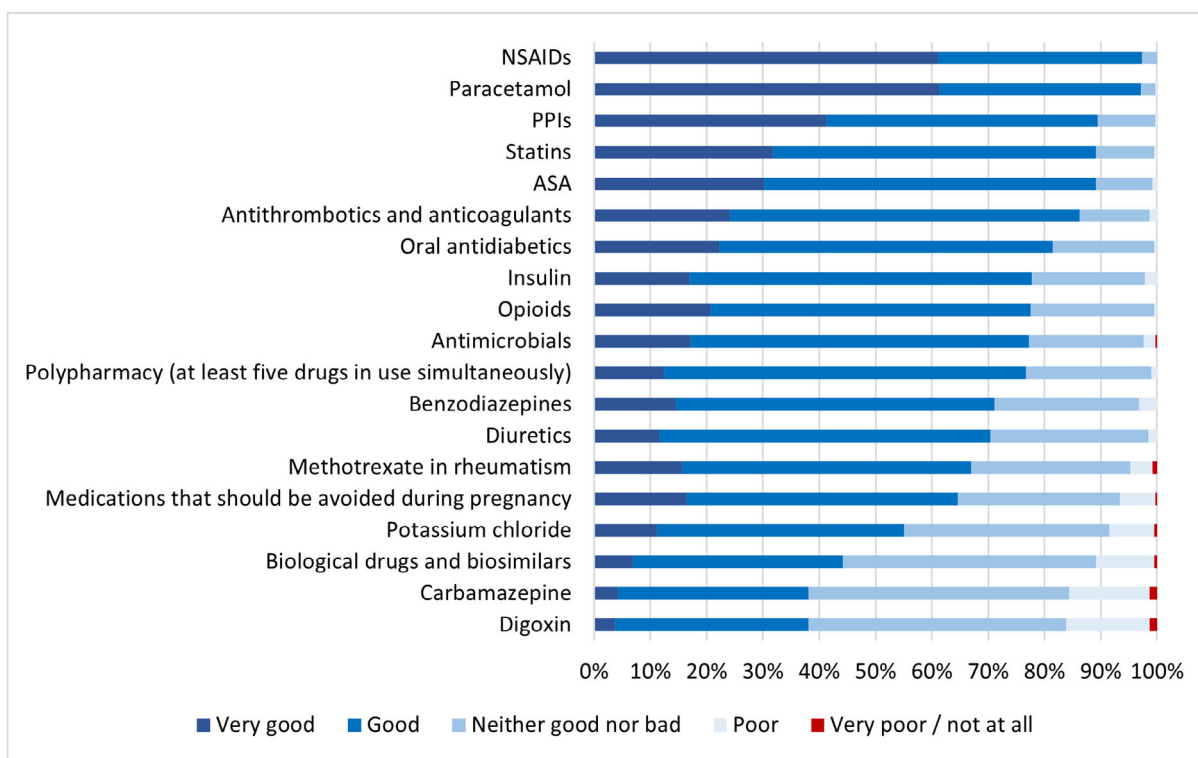
assessing real-life MR competence of students after advanced-level pharmacy internship. An alternative for this kind of on-site assessment method could have been a traditional formal assessment by using an exam at the university focusing on testing theoretical pharmacological knowledge. Our assessment method's advantage is that it facilitates multifaceted reflection of performance and application of skills in real-life patient-oriented practice in medicine optimization. Thus, the evaluation extends beyond theoretical knowledge towards knowledge application. Students also have an opportunity to discuss the assessment outcome in-person with the same experienced and specialized preceptor who guided them through the entire MR process for a real patient.

The involvement of both the students and preceptors in the assessment was important to identify whether the assessments were influenced by the effect of over- and under-estimation of the

competence. According to the students' self-estimates and their clinically trained preceptors' estimates, most of the third-year pharmacy students seemed to have acquired a very good or good MR competence during their BSc (Pharm) degree studies. Preceptors' estimates for students' MR competence were overall higher than students' self-estimates ( $p < .05$ ). Self-assessed MR competence was higher in knowing the general principles of reviewing medications (Figure 1) and lower in competence areas requiring more advanced clinical skills and practical hands-on experience, such as implementing medication changes (e.g. deprescribing), knowing medications that need special monitoring (e.g. laboratory tests), knowing how to create contacts to social and healthcare and knowing how to work interprofessionally (Figure 2). This was quite an expected result, as advanced-level MR competencies are demanding and develop through practical experience over time. The results indicate the same kinds of strengths and



**FIGURE 4** Students' ( $n = 378$ ) self-assessed competency in disease self-management and follow-up ( $n = 9$ ).



**FIGURE 5** Students' ( $n = 378$ ) self-assessed competency in medication ( $n = 19$ ) risk management and follow-up.

weaknesses in MR competencies that have been previously found in practising pharmacists<sup>26,43,53</sup> and graduating BSc pharmacy students<sup>45</sup> in Finland. To our knowledge, undergraduate pharmacy students' MR competence has not been studied internationally to this extent using nationally defined competence criteria as a reference.

The primary purpose of the study was the assessment of learning. However, the assessment produces information for curriculum

development purposes. In this respect, the results show rather big differences in students' self-assessed competences of disease self-management and follow-up practices, as well as in management and follow-up of selected medicines widely used in outpatient care. Of these diseases, hypertension and type 2 diabetes were assessed to be well known, unlike metabolic syndrome, although hypertension and type 2 diabetes are key diseases in this syndrome. Similarly, asthma

treatment was assessed to be well known, unlike COPD, although they are both long-term lung diseases. The findings suggest that knowledge building related to diseases may remain fragmented in theoretical studies at the university and does not provide an adequate overall picture of diseases and their management, including pharmacotherapy. Most widely used [analgesics](#), paracetamol (i.e. acetaminophen) and NSAIDs, were self-assessed well known. However, for example, the national mystery shopping studies conducted in Finland over time have consistently found major improvement needs in the [medication counselling](#) practices of the over-the-counter analgesics.<sup>54-56</sup> Of the diseases common among the older population, dementia was assessed poorly known, indicating that pharmacy education may need more emphasis on geriatric care and pharmacotherapy. Students also reported rather low competency in biologics, indicating a need for greater focus in pharmacy curriculum on this fast-growing category of pharmaceuticals in clinical use.<sup>57</sup> Based on our experience, it is recommended to add the same kind of set of common chronic diseases and high-risk medications to the national MR competence criteria<sup>42,43</sup> to enhance continuous learning of practising pharmacists.

Our study findings suggest that further development of the undergraduate pharmacy curriculum is needed to prepare students for interprofessional care teamwork and creating contacts with social and healthcare units. The same challenges in interprofessional care and teamwork skills have been found in numerous previous studies involving other healthcare students, such as medical and nursing students. Learning these skills could be facilitated by organizing joint courses and workshops with other healthcare students and adding more case-based learning. Previous studies have found these skills challenging also for practising health professionals, including pharmacists, implying that there might also be other barriers to overcome, such as lack of mutually agreed communication processes and practices between community pharmacies and healthcare units.<sup>26</sup> The same kinds of aspects have been highlighted by the European Commission when it recently updated the minimum competence requirements for subjects, knowledge and skills for the profession of pharmacists.<sup>17,58</sup> These included patient-centred care, clinical pharmacy, pharmaceutical care and inter- and multidisciplinary collaboration.

#### 4.1 | Strengths and limitations

The assessments involved students from 3 consecutive years, which increases the reliability of the results. As the self-assessment assignment was a mandatory internship assignment, the data covered all pharmacy students completing their advanced-level pharmacy internship during the 3-year period in 2020–2023.

As an assessment method, self-assessment has its limitations, and the results may not fully reflect the actual competence each student holds. However, the trends were found to be similar in students' and preceptors' assessments although the correlation was missing in individual paired comparisons ( $p < .05$ ). Students with less acquired competence often fail to recognize their competence gaps,

thus over-estimating their actual skills. This 'illusion of confidence' is called the Dunning–Kruger effect, and it describes the cognitive bias to inflate self-assessment.<sup>59,60</sup> By contrast, high achievers may fail to recognize their talents and experience self-doubt and a lack of confidence. This so-called 'imposter syndrome' can be likened to the inverse of the Dunning–Kruger effect.<sup>61,62</sup> In this study, the preceptors assessed students' MR competence as better than students themselves, which may indicate that students have rather under-estimated than over-estimated their competence. One explanation of this phenomenon might be that students have compared themselves to experienced professionals, or the highest competent students may have assumed that their peers are well skilled and, thus, under-estimated their own competence.<sup>59,63</sup> This bias can be at least partly mitigated by the preceptor-conducted assessment. Therefore, it is important to maintain both the student's self-assessment and the preceptor-conducted assessment in the advanced-level pharmacy internship to balance over- and under-estimation of students' MR competence.

#### 4.2 | Implications and future research

In Finland, MR education has been nationally implemented to pharmacy curriculum to the extent that the graduating students have [achieved](#) MR competence during the BSc (Pharm) studies since 2017, being fully implemented nationally since 2022.<sup>34,37</sup> Although the newly graduated pharmacists have the MR expertise, the majority of pharmacists who graduated earlier than 2017 do not have it.<sup>37,43,45</sup> This has most likely delayed the large-scale implementation of patient care-oriented services in community pharmacies although their implementation has been among the high-priority medicines policy goals.<sup>64,65</sup> This can also lead to a 'chicken or egg paradox', which means that having not enough clinically trained practising pharmacists results in the situation that the services are not provided in such a volume required for the recognition in the national public reimbursement scheme.<sup>29,65</sup> This lessens community pharmacists' interest in providing these services and customers' interest in using them. Neither are these services recognized by the recently established regional well-being services counties responsible for providing social and health services for their residents.

Even though the students and the preceptors should be familiar with the MR competence statements,<sup>42,43</sup> at least some of the statements may have been difficult to understand, posing risk for face-validity bias in the competence assessment. Therefore, future research should focus on investigating students' and preceptors' narratives concerning meanings of the MR competence items. Furthermore, it would be important to update the national MR competence criteria<sup>42,43</sup> with items related to management and follow-up of some common diseases and medications. Adding them would extend the coverage of the MR competence assessment to a more therapeutic direction. In future studies, it would be interesting to compare competencies of students from different pharmacy schools as the curricula vary between universities even following the same EU directive for minimum competencies required for licensed

pharmacists. This exercise would be useful to repeat as a follow-up for the implementation of the EU Commission Delegated Directive (EU) 2024/782 by March 2026.<sup>58</sup>

## 5 | CONCLUSIONS

Combining self-assessment and assessment by an MR specialized preceptor proved to be a feasible method for assessing MR competence instead of traditional formal assessment to indicate the real-life MR competence of students after advanced-level pharmacy internship. The involvement of the students' and the preceptors' assessment can balance the effect of over- and under-estimation of the competence, students tending to under-estimate their skills. The previously validated national MR competence criteria for pharmacists provided a suitable assessment reference although it is recommended to be extended to cover items assessing management and follow-up of common chronic diseases and high-risk medications. Adding them would extend the coverage of the MR competence assessment to a more therapeutic direction.

### AUTHOR CONTRIBUTIONS

Katja Leiman has substantially contributed to the design of the work, collected the data, conducted the data analyses and wrote the manuscript with the help of Aleksí Westerholm and Marja Airaksinen. Noora Lias and Tanja Lindholm commented and helped finalizing the manuscript. They also contributed to the development of the MR self-assessment tool on the basis of the national MR competence criteria set by AATE<sup>42</sup> and Lias et al.<sup>43</sup> Tero Vahlberg acted as a specialist in statistical analysis.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. Also, the authors declare that the results presented in this paper have not been published elsewhere.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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