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ESCP BEST PRACTICE

Medication reconciliation and seamless care led by clinical pharmacists in Slovenia: a national reimbursed program ensuring safe and effective transition of care

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Abstract

Background Medication errors frequently happen during patients' transitions between different healthcare settings. Medication reconciliation, provided by various healthcare specialists, could help reduce these errors. However, clinical pharmacists do not lead this service nationally in most countries.

Aim This paper describes the development, implementation, and national evaluation of medication reconciliation in Slovenia as part of seamless care.

Setting All hospitals and community pharmacies in Slovenia.

Development The initial step involved the successful development of legislation in Slovenia. This process, termed 'seamless care,' was defined as a pharmaceutical service and five different steps of this process were developed: medication reconciliation upon admission (including the best possible medication history), during discharge, personal medication cards, and medication dispensing. A standard operational procedure was established in 2023 to guide these practices.

Implementation A critical milestone in the implementation process was establishing a successful reimbursement scheme in 2023. Hospitals and community pharmacies implemented this service following successful reimbursement. Pharmacy managers and heads of hospital pharmacy departments were responsible for overseeing its implementation in hospitals and community pharmacies. The Health Insurance Institute of Slovenia is measuring the implementation.

Evaluation Trials were conducted in various Slovenian hospitals to evaluate this service's effectiveness, appropriateness, and adoption before its full implementation (reduced medication-related problems were observed). The Health Insurance Institute of Slovenia is currently evaluating the sustainability of the service and providing feedback to the providers.

Conclusion Slovenia is the first country in this part of Europe to fully reimburse and implement medication reconciliation as a pharmaceutical service. This practice holds promise for exporting to other countries.

Keywords Clinical pharmacy · Community pharmacies · Hospitals · Medication errors · Medication reconciliation · Slovenia

Facilitators of best practice

- Appropriate pharmaceutical legislation (e.g., recognizing medication reconciliation as a pharmaceutical service) represents the first step toward successful service development.
- National reimbursement is the most crucial step in service implementation.
- Positive evaluations and evidence, including a reduction in medication errors through pharmacist-led medication reconciliation, facilitate service development.

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Barriers of best practice

- Slow national reimbursement leads to slower implementation.
- A shortage of clinical pharmacists is a critical factor contributing to slower implementation.
- Limited data on cost-effectiveness and acceptability pose challenges for sustainability.

Background

Medication errors significantly cause treatment failures, deaths, and additional healthcare costs worldwide [1]. According to the World Health Organization (WHO), medication-related harm accounts for more than half of the overall preventable harm in medical care globally, with an estimated annual cost of €4.5–21.8 billion in Europe [2]. Approximately 50% of medication errors are preventable [3]. These errors occur at all levels of healthcare, with the majority happening during care transitions (e.g., hospital admission, discharge, and transfer). The most common types of medication errors include dose omission, incorrect dosing, and improper administration speed [4]. At hospital discharge or admission, about 30% of patients experience at least one unintended medication discrepancy or medication error [5]. Prescribing errors are particularly prevalent in hospitals, where 7% of medication orders and 50% of hospital admissions include such errors [6]. In recent years, WHO has focused on medication errors and recommends prioritizing high-risk situations, polypharmacy, and care transitions. This involves collaboration between healthcare professionals and the practice of medication reconciliation [7].

Clinical pharmacists play a crucial role in medication reconciliation and ensuring seamless care in some countries [8–10]. However, in most countries, this responsibility still largely falls on physicians and nurses [8, 9]. It is important to emphasize that seamless care and medication reconciliation fall within the scope of clinical pharmacy [11]. Resolution CM/Res(2020)3 states that clinical pharmacists must provide medication reconciliation and monitor patients. This resolution serves as a legal framework for 39 European member states to promote and implement pharmaceutical care, including medication reconciliation [12].

Clinical pharmacists significantly improve the accuracy of medication reconciliation by 50% or more, as demonstrated in numerous studies [13, 14]. Despite this positive evidence, medication reconciliation services are not reimbursed in most European countries, and pharmacists often do not play a key role in this process [8, 9]. To address this, national efforts are needed to establish reimbursed clinical pharmacy practices, including medication reconciliation and seamless care.

Aim

This paper describes the development, implementation, and national evaluation of medication reconciliation in Slovenia as part of seamless care.

Development

Medication reconciliation was initially developed in only a few Slovenian hospitals, with the University Rehabilitation Institute in Ljubljana leading the way more than 10 years ago, before this service was legislated as a pharmaceutical service. Clinical pharmacists at this institution provided medication reconciliation at admission and discharge and conducted medication reviews. The hospital employed them independently for this purpose (the service was not reimbursed but supported by hospital management). The University Clinic Golnik later adopted this good practice. According to data collected at the University Clinic Golnik, 108 patients were included in the study describing this service. Of all medications, 72.4% were associated with discrepancies. Most of these discrepancies occurred in medication orders (76.2%) and discharge letters (69.9%), highlighting a significant opportunity for clinical pharmacists to intervene [15].

This good practice was further enhanced by the newest Pharmaceutical Act, which has been valid since 2017, where the service was recognized solely as a pharmaceutical service [16]. The Act defines seamless care as the smooth and safe transition of patients between different healthcare providers (e.g., from hospital to primary care). In addition, the Slovenian Ministry of Health issued a Sub Act, valid completely from 2023, that details seamless care and medication reconciliation in hospitals [17].

Seamless care in hospitals includes the following steps [17]:

1. Best possible medication history,
2. Medication reconciliation at admission (the pharmacist reviews the current pharmacotherapy and best medication history, making recommendations to the attending physician for any necessary changes),
3. Medication reconciliation at discharge (the pharmacist reviews the discharge papers and last-day pharmacotherapy, providing recommendations to the attending physician),

4. Issuing a personal medication card before discharge (which is integrated into the patient's eSystem), and
5. Home dispensing (only newly introduced or modified medications can be dispensed).

According to these acts, only clinical pharmacist specialists based in hospitals (with a 3-years postgraduate specialization in clinical pharmacy) are authorized to manage this healthcare program, called seamless care, within hospitals [17, 18]. These clinical pharmacists must be involved in all clinical activities, have full access to patients and all related datasets, and provide medication reconciliation and reviews as needed. The Act also mandates that clinical pharmacists directly access patients and their datasets [17]. The provider of seamless care services in the hospital must be a hospital pharmacist specialist (in clinical pharmacy) employed by the hospital and who has completed a specialisation in clinical pharmacy. All seamless care steps must be documented in the hospital's electronic system [17]. The Act and Sub Act do not define seamless care in primary care [16, 17].

In addition, the Slovene Chamber of Pharmacies developed a standard operating procedure (SOP) for the service in hospitals and community pharmacies. The SOP defines the requirements for seamless care inclusion (e.g., polypharmacy, low adherence, and cognitive decline) and outlines the steps for providing seamless care, in accordance with the Sub Act. With these steps, seamless care was recognized solely as a pharmaceutical service. Despite these efforts, the service was not implemented in hospitals or community pharmacies due to a lack of reimbursement. The primary reason was that hospitals did not employ clinical pharmacists for this service, even though it was legislated as an obligatory service for hospitals.

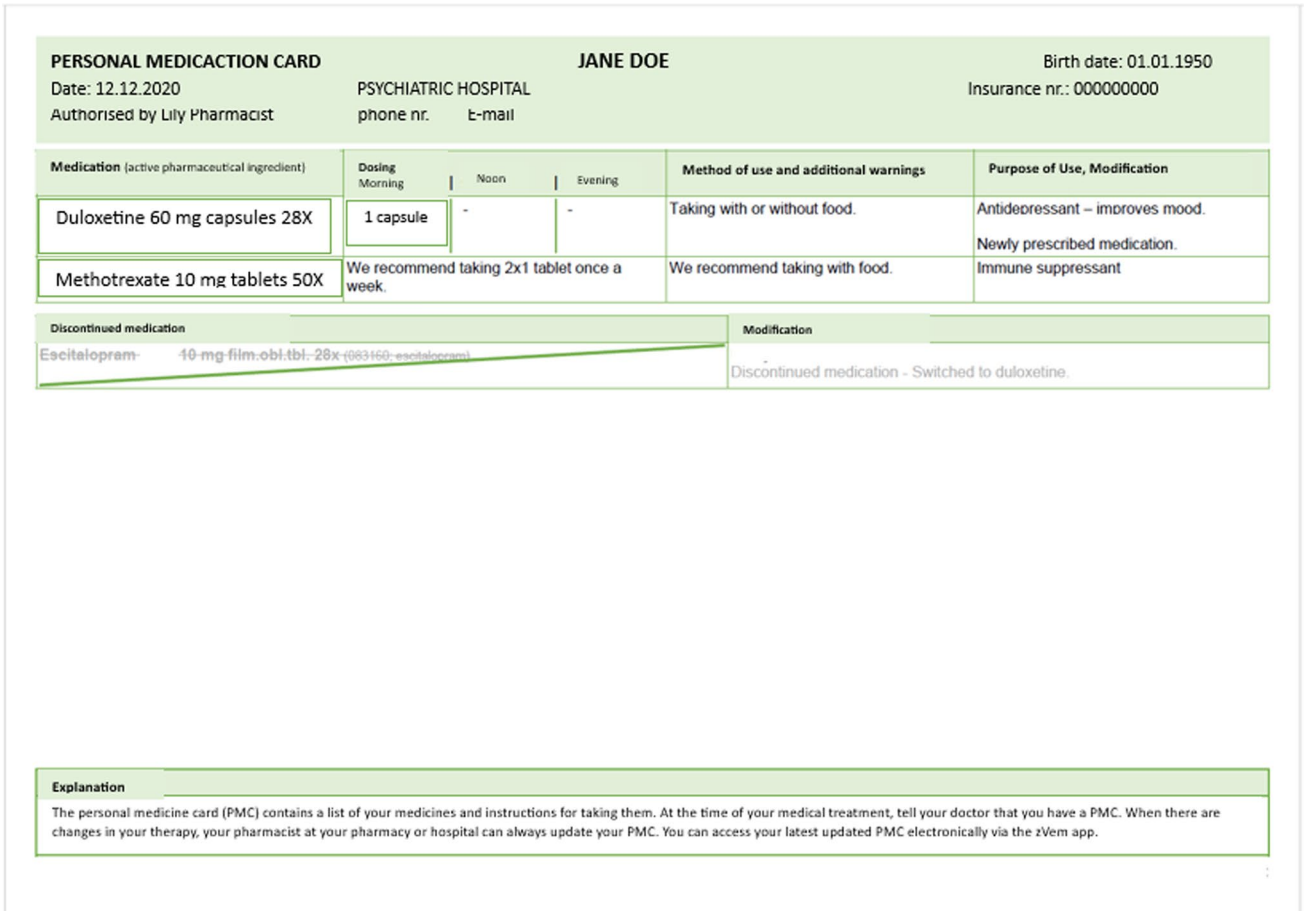
The final development included national reimbursement, a key step for the successful implementation of this service. Since 2023, this service has been reimbursed (€55 per patient), meaning that the Health Insurance Institute of Slovenia (HIIS) pays an additional amount for each hospital patient to the hospitals. Various factors determine the price, including the specified duration of the service, salaries, materials, and amortization. The price can be adjusted once per year. All hospitals can apply for this program, with no limit on the number of patients included. Clinical pharmacists in hospitals decide on patient inclusion based on the inclusion/exclusion criteria defined in the SOP, known as seamless care. HIIS reimburses each case and hospitals are required to employ clinical pharmacists for this service as part of the contractual agreement with HIIS. For complete payment, the service must include all four steps: 1) the best possible medication history, 2) medication reconciliation at admission, 3) medication reconciliation at discharge, and 4) the issuance of a personal medication card before discharge. Home dispensing is paid separately, as it is performed in community pharmacies [18]. Cases are time-limited to hospital stays of at least 24 h, the minimum time required for payment. Hospital pharmacists can dispense only newly prescribed or modified medications to patients, limited to the smallest package.

The personal medication card before discharge is a crucial document (Fig. 1), prepared in standardized same format, used by all clinical pharmacists (required to perform by the Slovenian Ministry of Health). This card is given directly to the patient and saved in the system, visible to all physicians and pharmacists throughout Slovenia. The time required for this service was standardized by the Slovene Chamber of Pharmacies (60 min per patient), and from this, a payment model was developed (€55 per patient).

In addition, this service has been extended to community pharmacies in 2023, where they can update personal medication cards (reimbursed at an extra €5 per patient by HIIS). Starting in 2024, community pharmacies can include new patients in the seamless care program, receiving an additional €30 per patient from HIIS. In community pharmacies, pharmacists only update existing personal medication cards issued in hospitals (e.g., medication changes) and/or perform new medication cards, but in hospitals, hospital pharmacists must perform all five steps described above and in the Sub Act [17]. This development fosters strong connections between hospital and community pharmacies, ensuring accurate medication reconciliation. As a result, the number of clinical pharmacists in hospitals has increased, and hospital pharmacy leadership is now in a stronger position to request new staff from hospital management, as these services are reimbursed. This development is aligned with the Medical Research Council Framework for Developing and Evaluating Complex Interventions [19, 20].

Implementation

In Slovenia, implementation is based on reimbursement, which can be done in two general ways: 1) a proposal to the Reimbursement Committee at the Ministry of Health (evaluation process – health technology assessment), or 2) proposals from the Chambers, HIIS, and the Ministry of Health for negotiations. Typically, new proposals are referred to the Reimbursement Committee, while proposals included in legislation or tested in pilot trials are referred for negotiations. A formal pilot trial was not required for the implementation of this service in Slovenia because it had already been included in the legislation before, which accelerated its rollout. However, a pilot trial was necessary for clinical pharmacist services in ambulatory settings within primary healthcare systems, significantly extending the time from pilot to national implementation (5 years) [21]. The most crucial step in the national development of this service was



PERSONAL MEDICACTION CARD — **JANE DOE** — Birth date: 01.01.1950

Date: 12.12.2020 — PSYCHIATRIC HOSPITAL — Insurance nr.: 000000000

Authorised by Lily Pharmacist — phone nr. — E-mail

Medication (active pharmaceutical ingredient)	Dosing Morning | Noon | Evening	Method of use and additional warnings	Purpose of Use, Modification
Duloxetine 60 mg capsules 28X	1 capsule | - | -	Taking with or without food.	Antidepressant – improves mood. Newly prescribed medication.
Methotrexate 10 mg tablets 50X	We recommend taking 2x1 tablet once a week.	We recommend taking with food.	Immune suppressant

Discontinued medication	Modification
~~Escitalopram 10 mg film-obl.tbl. 28x (083160 escitalopram)~~	Discontinued medication - Switched to duloxetine.

Explanation

The personal medicine card (PMC) contains a list of your medicines and instructions for taking them. At the time of your medical treatment, tell your doctor that you have a PMC. When there are changes in your therapy, your pharmacist at your pharmacy or hospital can always update your PMC. You can access your latest updated PMC electronically via the zVem app.

Fig. 1 Personal medication card

the introduction of national reimbursement by the HIIS in 2023 [18]. With this reimbursement, the service became available to all hospitals and community pharmacies. The SOP has also been developed, and seamless care in community pharmacies has not been included in the Sub-Act, which is the main reason why it was initially implemented in hospitals. Reimbursement for community pharmacists has also enabled its implementation in community pharmacies.

Despite this, not all Slovenian hospitals have implemented the service. As of September 2024, 18 months after the reimbursement was introduced, 80% of Slovenian hospitals (20 out of 25) were providing the service. Some hospitals have not implemented it due to a lack of clinical pharmacy specialists. Additionally, there are concerns about the sustainability of the service, as the uptake in some hospitals remains low [22]. This slow adoption is primarily due to a shortage of clinical pharmacists, poor implementation strategies by hospital pharmacies, and low interest in the service.

In the first 8 months of 2024, Slovenian hospitals provided 6970 seamless care cases—significantly lower than the planned 23,500 cases [22]. There are also differences in uptake among hospitals, with varying uptake levels. Implementation is also progressing in community pharmacies, though regional differences exist, and it is still too early for comprehensive comparisons. One concerning issue is the lack of implementation at the largest hospital, University Medical Centre Ljubljana [22].

Home dispensing has not been widely implemented, with less than 20% of hospitals dispensing medications for home use [22]. There are several obstacles, particularly because only newly introduced or modified medications can be dispensed, and issues with electronic hospital systems persist. Hospital pharmacy leadership needs to address these challenges to enable home dispensing for all eligible patients. Implementation is also underway in community pharmacies, where pharmacists modify hospital-prepared personal medication cards and include new patients. However, there is limited data available, as the service has only recently been reimbursed.

Clinical hospital pharmacists, community pharmacists, nurses, physicians, and administrative staff are all involved in the service and are essential for its successful implementation. Pharmacists must collaborate with attending physicians to provide medication reconciliation and frequently

communicate with nurses regarding patient discharges and admissions. Patients should not be discharged before medication reconciliation, which has contributed to the limited implementation in some hospitals. Administrative staff prepare discharge papers on behalf of attending physicians, so pharmacists must also coordinate with them. Therefore, pharmacists must effectively communicate with all healthcare professionals and administrative staff to ensure successful service implementation. Due to time constraints and a lack of sufficient staff, pharmacists were unable to proceed with the process, which represents a crucial limitation for its effective implementation. Pharmacists are ultimately responsible for consulting patients about their pharmacotherapy at admission and discharge, including medication administration. This information is summarized in the personal medication card, which includes all medications, their indications, correct administration, dosing, and any discontinued medications.

Hospital pharmacy leadership is responsible for the successful implementation of this service. This means they must establish protocols for implementation within hospitals (e.g., incorporating it into hospital SOPs). Due to legislation, clinical pharmacists are employed in hospital pharmacies, and hospital managers, in collaboration with pharmacy managers, are responsible for staffing, including the clinical pharmacists. The Ministry of Health and the Slovene Chamber of Pharmacies actively encourage this implementation.

A specialization in clinical pharmacy (3 years in Slovenia) is required to perform this service in hospitals. In community pharmacies, non-specialist pharmacists must obtain a special certificate from the Slovenian Chamber of Pharmacy to perform this service. Additionally, various educational programs are available to enhance pharmacists' skills, such as those focused on seamless care and medication reconciliation. These programs are organized as one-day or multi-day seminars, open to all pharmacists upon prior registration. Each seminar covers a specific topic, explored through lectures and workshops. Pharmacists who attend these sessions earn license points, which are necessary for license renewal and essential for practicing pharmacy. These trainings aim to support continuous professional development, maintaining high levels of knowledge and fostering new skills.

Evaluation

The researchers and the HIIS are responsible for the evaluation of this service. Slovenian researchers have evaluated this service and published several papers on the topic [18, 23, 24]. In the first study, conducted before the introduction of national reimbursement, the authors investigated adverse drug events during the transition of care in a randomized clinical trial, comparing pharmacist-led medication reconciliation with a control group [23]. The study included 120 adults hospitalized at the University Clinic Golnik. At admission, medication errors, defined as unintentional discrepancies, were detected in 18.3% (247 out of 1347) of prescriptions, and these discrepancies persisted mainly until discharge (88%). Pharmacists reported only 29.1% of unintentional discrepancies to the physicians. There were no statistically significant differences in outcomes between the two groups. The authors concluded that medication reconciliation at hospital admission failed to reduce unintentional discrepancies and adverse drug events, possibly due to inadequate integration into clinical practice [23] This study focused solely on hospital admissions before the service was implemented in Slovenia.

In a subsequent prospective study (a pragmatic clinical trial) involving 414 patients at the University Clinic Golnik, the researchers examined unplanned healthcare utilization within 30 days of discharge, clinically important medication errors at hospital discharge, and serious unplanned healthcare utilization within the same timeframe [24] The number of patients with medication errors was significantly higher in the control group compared to the pharmacist-led medication reconciliation group (9.3% vs. 61.9%). However, the difference in healthcare utilization was not statistically significant [24]. The authors advocated for the routine inclusion of pharmacist-led medication reconciliation in practice.

In the third study, a case study, the authors described two clinical cases in a psychiatric hospital [18]. In these cases involving patients with mental disorders, clinical pharmacists identified medication-related problems and resolved them in collaboration with hospital psychiatrists. In the first case, pharmacists suggested adding omitted medications: metformin 1000 mg twice daily, linagliptin 5 mg daily, and allopurinol 100 mg daily. In the second case, pharmacists identified medication discrepancies on the discharge letter by comparing it with the medication chart; specifically, levothyroxine 75 mcg and the correct dosages of perindopril, indapamide, and amlodipine (5/1.25/5 mg) were missing from the discharge documentation. The psychiatrists accepted all recommendations. The authors also highlighted the important role of hospital clinical pharmacists in recognizing additional problems, such as untreated hypercholesterolemia, and providing medication reviews during hospitalization [18].

HIIS tracks the number of seamless cases monthly and only reports data related to program sustainability in their evaluations [22]. Some master's theses have also been published on this topic, both before and after the introduction of reimbursement, focusing on the differences in medication-related problems at admission and discharge, which predominantly showed positive results.

Discussion

A seamless care health program, including medication reconciliation, has been successfully developed at the national level in Slovenia and is accessible to almost all Slovenian patients. In this context, Slovenia is the first country in Central and Southeastern Europe to develop this service nationally [8, 24, 25], marking a significant step for the advancement of clinical pharmacy in Europe. This successful implementation could serve as a model for many other European countries. In addition to the previously implemented medication review in primary care settings in Slovenia [21], seamless care represents the second successfully developed, reimbursed, and implemented clinical pharmacy service in the country.

Successful national reimbursement and legislation were this initiative's two most essential facilitators. The legislation that assigned pharmacists responsibilities for seamless care included this service, as only pharmaceutical services promoted this process [16, 17]. This step increased pharmacists' responsibilities and duties regarding medication reconciliation at admission and discharge, where they previously did not play a key role. Legislation laid the groundwork for successful reimbursement, which occurred 7 years later. National reimbursement allocated funding for these services and classified the service as a pharmaceutical service within the payment scheme. It also allowed pharmacy leadership to hire more staff, which was not feasible before.

In this context, hospitals and community pharmacies employed more pharmacists and encouraged them to pursue specialization in clinical pharmacy in Slovenia. Both hospitals and community pharmacies are now incentivized to provide this service because they receive additional payment. This example illustrates that national reimbursement and implementation are impossible without appropriate collaboration with insurance companies and governmental ministries. National reimbursement also motivates other hospitals to offer this service as they seek to ensure equal access to services across Slovenia. As a result, implementation becomes much more accessible, with fewer obstacles from hospital management, since these services already exist in many facilities.

There are several important barriers to the development and implementation of the service. Progress was primarily slow due to a lack of reimbursement and legislation. Implementation varies among hospitals due to staffing shortages and the varying development of clinical pharmacy services in some institutions. In many hospitals, clinical pharmacists are already part of multidisciplinary teams (e.g., ward rounds), which facilitates service implementation. However, in some institutions, hospital management does not support so much the development of this service or the employment of pharmacists.

The national reimbursement in Slovenia largely addresses these barriers, enabling faster implementations. Some challenges are also linked to the electronic system, which is not connected nationally. This issue has mostly been resolved by the personal medication card application developed by the Ministry of Health. Now, all pharmacists use the same cards within the same system, making them visible to all pharmacists and physicians.

Barriers in community pharmacies are primarily related to a lack of reimbursement and different levels of service development and legislation. However, this situation has improved over the past few years, with more pharmacies beginning to provide the service. There are also significant barriers associated with home dispensing in the seamless care service, including regulations from the NIIS that should be revised shortly. Slovenia faces a significant shortage of general practitioners, and pharmacists could help alleviate this issue by providing 3 months of medication dispensing from hospital pharmacies until the first ambulatory visit (with all medications prescribed at discharge). Currently, hospital pharmacists can only dispense newly prescribed or modified medications in the smallest packages, which is often insufficient for a month's supply. As a result, patients are required to return to community pharmacies or consult their general practitioners. This issue should be an area for improvement in the future.

Barriers are also linked to a shortage of pharmacists, which could be addressed by establishing a new pharmacy faculty (currently, there is only one in Slovenia), expanding undergraduate and postgraduate educational programs, and increasing funding for specializations. These educational initiatives should also be carried out in collaboration with other healthcare professionals. Another barrier is the lack of supportive legislation for seamless care in community pharmacies; an Act to address this is currently under development in Slovenia.Many issues are associated with evaluating this service in Slovenia [18, 23, 24]. While there is positive evidence of fewer medication errors and medication-related problems, some studies have been published on this issue; however, there is a lack of patient-reported outcomes (e.g., quality of life) and cost-effectiveness (e.g., ICER) and acceptance studies related to ambulatory care clinical pharmacy services in primary care settings [18, 21, 23, 24]. This evaluation could also consider the impact on mortality and hospitalizations, for which there have not been many positive results thus far. Future evaluations of this service should include cost-effectiveness (e.g., ICER), patient satisfaction, patient-reported outcomes (e.g., quality of life), and acceptance, as these aspects require further study for a more comprehensive assessment.

Some hospitals need to improve sustainability, primarily based on the involvement of hospital managers and pharmacy leadership. Additionally, the service could be enhanced by allowing pharmacists to prescribe medications at admission and discharge, which would help reduce the workload for physicians, especially general practitioners.

Conclusion

Seamless care, including medication reconciliation, represents a successfully developed and implemented pharmaceutical service in Slovenia at the national level, ensuring appropriate access to this service for all patients. Studies have shown a reduction in medication errors; however, more evaluations are needed, including assessments of cost-effectiveness, sustainability, and acceptability across different healthcare settings. Challenges in implementation remain, such as a shortage of pharmacists, insufficient support from hospital managers, and lack of legislation, along with existing gaps like short dispensing times and a lack of data on patient-reported outcomes, including cost-effectiveness. These issues should be addressed in the near future. Slovenia is the first country in Central and Southeastern Europe to develop this service nationally, and this clinical pharmacy practice can be exported to other countries.

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