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Original scientific paper

An Analysis of Nurse Prescribing in Slovenia and Croatia: Current Practices, Attitudes, and Future Perspectives

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Abstract

Introduction. Nurse prescribing has been implemented in many countries to address physician shortages and improve healthcare efficiency. Nations like the UK, Ireland, and Sweden have established models allowing nurses to prescribe medications, with varying scopes and educational requirements. While some countries permit independent prescribing, others restrict it to certain conditions or medications. These systems have shown clinical benefits and cost-effectiveness of nurse prescribing.

Aim. This study explores current practices and the potential for implementing nurse prescribing in Slovenia and Croatia.

Methods. A cross-sectional survey was conducted from March to May 2024 on 185 nurses from Slovenia and Croatia. The questionnaire covered demographics, current practices, and attitudes toward nurse prescribing. Data were analyzed using IBM SPSS Statistics 20.0 with descriptive statistics and Chi-square tests. Participants from other countries were excluded from inferential analysis.

Results. Slovenian nurses reported greater involvement in medication-related tasks, such as independent medication administration (SLO=28.6%, CRO=15.8%) and therapy adjustment based on vital signs (SLO=24.4%, CRO=11.5%). Statistically significant differences were found in self-education and the use of medication-related applications, with Slovenian nurses showing higher engagement. Most

participants in both countries supported nurse prescribing under specific conditions, especially following additional training and within a legal framework.

Conclusion. Findings indicate broad support for nurse prescribing among nurses in both countries. Slovenian nurses are more involved in prescribing-related tasks even if there is no legal basis for it, while Croatian nurses are entering this area through new emergency care specializations. Future development requires targeted education, clear legal regulations, and strong interprofessional collaboration to ensure safe and effective nurse prescribing.

Introduction

Prescribing of medications has long been a competence reserved for the medical profession. However, this trend is changing due to the shortage of physicians, better and higher-quality education in nursing, increased interprofessional collaboration, and the rise in chronic diseases, with medication prescribing becoming a competency for nurses (1). Increasingly, countries such as Australia, Canada, Finland, Ireland, New Zealand, Sweden, the United Kingdom, and the United States allow nurses to prescribe medications (2). All these countries provide education and professional support for nurses. However, the education differs between countries; for example, in the United Kingdom and Ireland, education to acquire medication prescribing competencies consists of 26 days of theoretical training and 12 days of practical training, while in other countries, the training is longer and organized as a specialist study for nurses (e.g., Canada, Australia, USA) (2).

In 2011 the International Council of Nurses reported on the implementation of nurse prescribing worldwide. For example in 2010, Australia experienced a historic reform by expanding the scope of practice for nurse specialists, allowing them to prescribe medications in certain cases. Nurse specialists were granted the authority to prescribe medications within the healthcare insurance framework, enabling them to prescribe medications in both private and public practice. As a result, nurse specialists obtained the same prescribing authority as physicians (3). In Canada, it was observed that 14% of the population lacks access to a family medicine specialist, which triggered a reorganization and expansion of nurses' competencies. Nurses with higher education (nurse specialists) are allowed to prescribe medications from a predefined list for chronic conditions (e.g., medications for diabetes, bronchodilators, antihypertensives, etc.) (3).

Fourteen European countries have enacted legislation enabling nurse prescribing, 12 of which have implemented it nationwide (Croatia, Cyprus, Denmark, Estonia, Finland, France, Ireland, the Netherlands, Norway, Poland, Spain, Sweden, and the United Kingdom), while in Switzerland, this competence is limited to one canton. In contrast to these countries, Portugal strictly regulates and restricts prescribing to physicians, with minor exceptions such as administering insulin to diabetic patients or adrenaline during an anaphylactic reaction without a physician's order; however, this cannot be classified as medication prescribing (4).

The Swedish Association of Health Professionals emphasized in 2011 that nurses' prescribing rights should not be limited to specific workplaces or activities but should instead be determined by the level of knowledge demonstrated by the nurse. The Swedish National Board of Health and Welfare partially agreed and outlined three conditions for granting nurses the right to prescribe medications (3,4):

- A minimum of one year of additional training, including at least 15 credits in pharmacology and disease pathology (understanding disease progression with diagnosis and treatment);
- The nurse must work within a specific nursing specialty;
- To obtain the right to prescribe medications and a prescriber identification number, the nurse must be registered with the National Board of Health and Welfare.

Thus, nurses in Sweden can prescribe medications only within their specialty. However, nurses working in primary healthcare, home care, and nursing homes do not have prescribing rights (3).

In the United Kingdom, nurse prescribing is an established professional qualification. Research has shown that nurse prescribing is both cost-effective and clinically effective and enjoys significant patient support (2,5). Unlike other countries where nurses

are limited to specific medication lists or areas of specialty, nurses in the United Kingdom can prescribe almost all medications, with exceptions for certain opioids, dipipanone, and diamorphine used in addiction treatment (4).

Table 1 presents the scope of nurse prescribing across countries. It is evident that countries differ regarding the number of medications nurses can officially prescribe, the types of medical conditions for which they can prescribe, and the type of prescribing (4).

The type of prescribing refers to initial prescribing and subsequent prescribing where the former means that the nurse prescribes a new medication, while in the latter case, the nurse can issue repeat prescriptions after the diagnosis has been established and the medication initially prescribed by a physician (4). To obtain competencies for nurse prescribing, it is necessary to regulate legal provisions and the educational system. Many countries offer additional training after the completion of undergraduate studies, while some focus on specialized programs or supplementary courses (4).

The first to establish nurse prescribing was the United Kingdom, which distinguishes between the nurse supplementary prescriber, introduced in 1992, and the nurse independent prescriber, introduced in 2012 (4,6).

The Republic of Slovenia and the Republic of Croatia share certain similarities and differences when it comes to this topic. Until recently, both countries had comparable systems; however, since 2023, Croatia has introduced a specialist training program for bachelor's degree nurses in the field of emergency medical services, lasting one year. Upon completion of the program, nurses have acquired additional competencies, including the independent prescribing of therapy related to the management of emergency conditions in patients (7). This marks the first branch of nursing in Croatia to have a structured specialization with extended competencies related to the pharmacological management of patients. In Slovenia, there is still no model in place that would allow nurses to acquire additional competencies for prescribing therapy, and consequently, there is no legal framework to support such practice (9, 15). The growing need for interprofessional collaboration is confirmed by a comparative qualitative study conducted in Croatia and Slovenia (27). The research revealed that nurses in both countries face similar challenges—insufficient education in the field of pharmaceutical care, a sense of unequal status within the healthcare team, and a lack of effective communication with physicians and pharmacists. Despite differences in the healthcare system contexts, both settings recognize the need for additional competencies, more active involvement in research processes, and a system that adequately values their work (4, 9, 15, 27).

Although nurse prescribing is not implemented worldwide, an increasing number of countries are choosing to optimize their healthcare systems. With appropriate implementation and legal support, this could become part of nursing curricula and professional standards, thereby advancing nursing as a profession.

Aim

The aim of our research was to examine the current practice of nurse prescribing in Slovenia and Croatia, as well as the possibilities for implementing nurse prescribing in the future.

Within the aim of the research objective, we formulated three research questions:

- What is the current practice regarding medication prescribing by nurses?
- What are nurses' attitudes towards medication prescribing?
- What limitations, in nurses' opinion, would be necessary in the event of implementing nurse prescribing?

Table 1. **The scope of nurse prescribing in European Union countries (4,7)**

Country	Name/ Professional Title	Prescribing rights by major area and conditions					
		Vaccines	Contraceptives	Chronic conditions	Acute illnesses	Pain medications	Other
Croatia[9]	Nurse specialist in emergency services	/	/	/	IP (16 different medications)	/	/
Denmark[4]	Registered nurse	CP	CP	CP	CP	CP	CP
Estonia	Family nurse	/	CP (hormonal contraceptive)	CP (diabetes, hypertension)	CP (acute cystitis, nitrofurantoin)	/	/
Finland	Nurse prescriber	IP (influenza, hepatitis, varicella)[1]	IP (hormonal contraceptive)[1,2]	CP (asthma, dyslipidemia, hypertension)[1]	IP (pharyngitis) CP (UTI)[1]	IP (local anaesthetics)[1]	/
Ireland[5]	Nurse prescriber	IP	IP	IP	IP	IP	IP
Netherland	Diabetes, oncology, lung nurses	/	/	IP (diabetes, oncology, lung disease)	/	IP (oncology)	/
Netherlands[8]	Nurse prescriber	IP	IP	IP	IP	IP	IP
Norway	Public health nurse	IP	IP[3]	/	/	IP (adrenaline for allergic reactions, local anaesthetics)	IP (sterile equipment for IU implants)
Poland	RN (Master)	/	IP (gynaecological drugs)	IP (asthma)	IP (throat, ear, sinus, UTI)	IP (analgesics, locally acting anaesthetics)	IP (anti-emetics, anti-parasitic, IV infusion fluids)
Poland[6]	RN (Bachelor)	/	CP (gynaecological drugs)	CP (asthma)	CP (throat, ear, sinus)	CP (analgesics, locally acting anaesthetics)	CP (anti-emetics, anti-parasitic, IV infusion fluids)
Spain[7]	RN (Bachelor)	IP (according to vaccination schedule)	IP (emergency contraception)	CP	CP	CP	IP (OTC)
Sweden	RN (Bachelor)	/	/	/	IP (throat, mouth, dermatological diseases, GI, UTI)	IP (pain management)	/
United Kingdom[5]	Independent prescriber	IP	IP	IP	IP	IP	IP
United Kingdom	Supplementary prescriber	CP	CP	CP	CP	CP	CP

Note: [1]= not for children under the age of 12; [2]=not for women under age 35; [3]=only for women over 16 years of age; 4=continued prescribing according to local frame prescriptions and in a delegate model; [5]=initial prescribing rights of all medicines falling within nurse specialisation, restrictions and additional requirements apply to controlled medications; [6]=prescribing rights according to formulary of 12 groups of medicines; [7]= prescribing rights guaranteed to all RN within minimum 1 year work experience, for RN with less than 1 year work experience additional training required ; [8]=initial prescribing rights of all medicines falling within nurse specialisation; [9]=in accordance with the specialization in the field of emergency medical care; GI=gastrointestinal; UTI=urinary tract infection; OTC=over-the-counter medications; IP=initial prescribing; CP=continuous prescribing follow-up prescribing after first prescription issued by physician; IP= initial prescribing; CP=continued prescribing only

Methods

Study design

We employed a quantitative descriptive study approach using the survey method. A cross-sectional study was conducted from March 2024 to May 2024, involving nurses from Slovenia and Croatia. The online survey was distributed to various public healthcare institutions and social media.

Respondents

A convenience sample of nurses (n=185), including 117 from Slovenia and 68 from Croatia, was used (23). The average age of respondents was 35.8 years (SD=10.41), and the average length of work experience was 14.0 years (SD=10.47) (Table 2).

Participation in the survey was voluntary, and completing the survey implied consent to participate. The survey took approximately 10 minutes to complete.

Instrument

For the purposes of the research, a survey was created, based on a literature review (9, 10, 25, 26). The first part of the questionnaire collects demographic information and includes the question: "Do you have the legal right to prescribe medications in the country where you work?" Respondents were provided with four response options (Yes, I am allowed to prescribe all medications; Yes, I am allowed to prescribe medications exclusively within my area of specialisation; Yes, I am allowed to prescribe only certain medications as defined by law and No). The second part of the questionnaire refers to current practice related to prescribing medications. The first question of the second part was "Which of the following activities do you perform in your current clinical practice?" where we provided respondents with six possible answer and they were allowed to select multiple options (prolonging chronic therapy (renewing regular prescriptions), transcribing therapy into the patient's medical documentation (copying therapy to temperature charts), administering pain relief medications without a doctor's order, independently administering certain medications without a doctor's order (e.g., an additional antihypertensive tablet, gastric protection, etc.), suggesting to other healthcare professionals which therapy should be prescribed, adjusting medications without a doctor's order based on the patient's vital parameters). For the next four questions, "Do you ever alert a physician/clinical pharmacist about incorrect medication prescribing?", "Do you participate in any educational sessions organized by pharmaceutical company representatives (e.g., lectures about new medications)?", "Do you independently educate yourself about pharmacology, new medications, active ingredients, and drug effects?" and "Do you use medication support applications (e.g., smartphone apps) in your work?", we used a three-point scale: never, occasionally, always.

The third part of questionnaire refers to the possibilities for further practice in the field of medication prescribing. First question "To what extent should nurses be involved in medication prescribing?", we provided three possible answers: I disagree that nurses should prescribe medications; Nurses can prescribe medication depending on specific conditions or frameworks; Nurses can prescribe medication independently. Second question "What restrictions would be necessary if nurses were allowed to prescribe medications?" where we provided respondents with nine possible answer and they were allowed to select multiple options (without restrictions, they could only prescribe certain medications (limited list), only in specific contexts (special health conditions/specialization), after completing targeted training, they can only prescribe long-term medications, only low-risk medications, only over the counter medications, only in emergency situations, only within the treatment and healthcare plan). In the last question "Which of the following measures should be implemented to enable nurses to gain the competency to prescribe medications?", four multiple-choice answers were offered (Introduction of specializations in nursing (specific knowledge in a narrow specialty area, with the option to prescribe only within that area), introduction of broader education in pharmacology at the undergraduate level, introduction of a one-year postgraduate course on medication prescribing, Legally regulate that nurses can prescribe medications according to established protocols (e.g., adrenaline, amiodarone, atropine, glucose, etc.). The Cronbach's alpha coefficient for the internal consistency of our questionnaire was 0.67.

Ethics

The study was approved by the Ministry of Health, Medical Ethics Committee of the Republic of Slovenia with serial number: 0120-468/5022/6. The study was conducted in accordance with the principles of the Helsinki-Tokyo Declaration (16).

Statistics

The data were entered in an Excel spreadsheet and analyzed in SPSS 20.0 software (IBM Corp., NY, USA) for statistical analysis. The normality of the distribution of all variables was tested using the Kolmogorov-Smirnov test for normality. It was found that all variables significantly deviate from normal distribution. For analysis we use Descriptive statistics and Chi-square test of independence.

Results

A total of 185 nurses participated in the study. Most of the participants were registered nurse (48.1%) and most of them were women (69.7%).

Most respondents do not have legal rights to prescribe medications (n=184; 99.4%) only 1 respondent has legal rights to prescribe all mediations (0.6%).

Slovenian nurses reported higher engagement in all assessed practices. Specifically, 36.2% of Slovenian nurses indicated that they independently administer certain medications without a physician's order (e.g., additional antihypertensive drugs or gastric protection), compared to 20.0% in Croatia. Similarly, 30.8% of Slovenian nurses reported adjusting medications based on patients' vital parameters, in contrast to 14.6% of Croatian nurses. Although the difference was not statistically significant (χ^2=1.217, p=0.270).

Table 2. **Demographic characteristics of participants (n=185)**

Demographic data		n	%
Gender	Male	56	30.3
	Female	129	69.7
Education level	Nurse (high school)	77	41.6
	Registered nurse	89	48.1
	Master of nursing	19	10.3
Working environment	Nursing home	16	8.7
	Family medicine clinic	30	16.2
	Other specialty clinic	16	8.7
	Emergency medical services	65	35.1
	Intensive care unit	18	9.7
	Hospital ward at secondary level	28	15.1
	Hospital ward at tertiary level	5	2.7
	Home care and community nursing services	7	3.8

Other activities such as transcribing therapy into patient documentation (SLO 44.9% vs. CRO 23.3%), suggesting therapy to physicians (SLO 31.9% vs. CRO 22.7%), and administering pain relief without a physician's order (SLO 28.1% vs. CRO 12.4%) followed a similar pattern, favoring greater involvement of Slovenian nurses in medication-related decisions. However, none of these differences were statistically significant (Table 3).

The results revealed statistically significant differences between Slovenian and Croatian nurses across all examined medication-related practices. Slovenian nurses were significantly more likely to alert physicians or pharmacists about incorrect medication prescribing (χ^2=92.445, p<0.001), participate in educational sessions organized by pharmaceutical companies (χ^2=43.974, p<0.001), and engage in independent pharmacological learning (χ^2=95.636, p<0.001). Furthermore, the use of medication support applications was markedly higher among Slovenian nurses, with no reported usage among Croatian nurses (χ^2=128.701, p<0.001) (Table 4).

Table 3. **Current practice regarding prescribing medication by nurses**

Variables	Slovenia		Croatia		χ^2	df	p
	n	%	n	%			
Prolonging chronic medications (renewing regular prescriptions)	49	26.5	28	15.1	0.009	1	0.925
Transcribing therapy into the patient's medical documentation (copying therapy to temperature charts)	83	44.9	43	23.3	1.175	1	0.278
Administering pain relief medications without a physician's order	52	28.1	23	12.4	2.013	1	0.156
Independently administering certain medications without a physician's order (e.g., an additional anti-hypertensive tablet, gastric protection, etc.)	67	36.2	37	20.0	0.142	1	0.706
Suggesting to other healthcare professionals which medication should be prescribed	59	31.9	42	22.7	1.891	1	0.169
Adjusting medications without a physician's order based on the patient's vital parameters.	57	30.8	27	14.6	1.217	1	0.270

Note $\chi 2$=Chi-square test, df=degrees of freedom, p=statistical significance; The number and percentage present the answer YES

Table 4. **Current practice regarding prescribing medications by nurses**

Variables	Answers	Slovenia	Croatia	χ^2	df	p
Do you ever alert a physician/clinical pharmacist about incorrect medication prescribing?	never	23	63	92.445	2	***0.000***
	occasionally	70	5			
	always	24	0			
Do you participate in any educational sessions organized by pharmaceutical company representatives (e.g., lectures about new medications)?	never	58	68	43.974	2	***0.000***
	occasionally	49	0			
	always	1	0			
Do you independently educate yourself about pharmacology, new medications, active ingredients, and drug effects?	never	24	67	95.636	2	***0.000***
	occasionally	72	1			
	always	10	0			
Do you use medication support applications (e.g., smartphone apps) in your work?	never	11	68	128.701	2	***0.000***
	occasionally	45	0			
	always	44	0			

Note: $\chi 2$=Chi-square, df=degrees of freedom, p=statistical significance

Table 5. **Nurses' opinions on the right to prescribe medications**

	Slovenia		Croatia	
	n	%	n	%
I disagree that nurses should prescribe medications	35	18.9	25	13.6
Nurses can prescribe medications depending on specific conditions or frameworks	79	42.7	43	23.2
Nurses can prescribe medication independently with full autonomy	3	1.6	0	0.0

Note: The number and percentage present the answer YES

Future prospects of nurse prescribing

In Slovenia, 42.7% of respondents believed that nurses should be allowed to prescribe medications depending on specific conditions or frameworks, compared to 23.2% in Croatia. A small proportion of nurses in both countries supported full prescribing autonomy, with only 1.6% of Slovenian nurses in favor and none from Croatia (Table 5).

Table 6 outlines nurses' views on necessary restrictions if prescribing were to be allowed. The responses indicate that nurses conditionally support the introduction of prescribing rights, particularly under specific regulatory and educational frameworks, which implies overall support (Yes) for nurse prescribing under defined conditions.

The analysis of nurses' opinions on necessary restrictions for implementing nurse prescribing revealed several statistically significant differences between Slovenia and Croatia. A significantly higher proportion of Slovenian nurses supported prescribing only after completing targeted training (SLO=44.9%; CRO=9.2%), only for long-term therapy (SLO=50.8%; CRO=19.5%), only in emergency situations (SLO=49.2%; CRO=36.8%), and only within a treatment and healthcare plan (SLO=59.5%; CRO=24.9%) (Table 6).

The results show that statistically significant differences were observed between Slovenian and Croatian respondents regarding their support for introducing broader pharmacological education at the undergraduate level (χ^2=8.033, p=0.005), a one-year postgraduate course on medication prescribing (χ^2=21.637, p<0.001), and the legal regulation of nurse prescribing according to established protocols (χ^2=24.695, p<0.001). Significantly more Slovenian nurses agree with those statements (Table 7).

Discussion

The primary aim of this study was to explore current practices, attitudes, and future perspectives regarding nurse prescribing in Slovenia and Croatia. The findings indicate that Slovenian nurses exhibit greater autonomy and involvement in clinical activities related to medication management compared to their Croatian counterparts, despite the lack of formal legal regulation in Slovenia. This discrepancy may reflect differences in national healthcare policies, models of clinical delegation, and nursing education systems. The study shows that nurses in both countries generally support the idea of nurse prescribing, particularly when it is implemented under clearly defined conditions. This cautious yet positive stance reflects a responsible professional attitude towards expanding nursing roles. Nurses appear to favour dependent or protocol-based prescribing over full autonomy, indicating a preference for a regulated and structured approach. Such preferences were especially evident among Slovenian participants, who more frequently endorsed conditions like additional training, limitation to long-term or emergency therapies, and prescribing within care plans. These findings suggest that while nurses are open to assuming greater responsibility, they also recognise the importance of ensuring patient safety and maintaining interprofessional balance. This supports the argument that any future implementation should be gradual and informed by evidence and international experiences, taking into account the specific educational and regulatory contexts of Slovenia and Croatia. Furthermore, the proactive engagement of Slovenian nurses in pharmacology education and their use of digital tools indicate a readiness for more advanced clinical roles, whereas the recent introduction of specialisation in Croatia marks an important but still early step toward systemic reform. While support for full autonomy in prescribing remains low, conditional or dependent prescribing is widely accepted, particularly in emergency situations. These preferences reflect a cautious and safety-oriented approach among nurses, which aligns with practices in countries where nurse prescribing has been successfully implemented through a gradual, regulated process.

The expansion of nurse prescribing has emerged as a global trend aimed at optimizing healthcare systems, and improving patient access to medications. Nurse prescribing competencies have been integrated into healthcare systems in several countries, with various levels of autonomy ranging from collaborative prescribing under physician supervision to independent prescribing (8,18,19). However, the acceptance of nurse prescribing and its implementation remain subject to regional, professional, and regulatory considerations. Understanding current perspectives on

Table 6. **Restrictions in case nurse prescribe medications**

Variables	Slovenia		Croatia		χ^2	df	p
	n	%	n	%			
Without restrictions	0	0.0	2	1.0	3.554	1	0.059
They could only prescribe certain medications (limited list)	87	47.0	42	22.7	3.583	1	0.058
Only in specific contexts (special health conditions/specialization)	80	43.2	40	21.6	2.184	1	0.139
After completing targeted training	83	44.9	17	9.2	36.545	1	***0.000***
They can only prescribe long-term therapy	94	50.8	36	19.5	15.456	1	***0.000***
Only low-risk medications	62	33.5	27	14.5	3.041	1	0.081
Only over-the-counter medications	49	26.5	22	11.9	1.651	1	0.199
Only in emergency situations	91	49.2	68	36.8	17.582	1	***0.000***
Only within the treatment and healthcare plan	110	59.5	46	24.9	22.624	1	***0.000***

Note: χ2=Chi-square test of independence, df=degrees of freedom, p=statistically significant, The number and percentage present the answer YES

Table 7. **Measures to be implemented to enable nurses to gain the competency to prescribe medications**

Variables	Slovenia		Croatia		χ^2	df	p
	n	%	n	%			
Introduction of specializations in nursing (specific knowledge in a narrow specialty area, with the option to prescribe only within that area)	93	50.3	52	28.1	1.348	1	0.246
Introduction of broader education in pharmacology at the undergraduate level	70	37.8	26	14.1	8.033	1	***0.005***
Introduction of a one-year postgraduate course on medication prescribing	72	38.9	18	9.7	21.637	1	***0.000***
Legally regulate for nurses to prescribe medications according to established protocols (e.g., adrenaline, amiodarone, atropine, glucose, etc.)	69	37.3	18	9.7	24.695	1	***0.000***

Note: χ2=Chi-square test of independence, df=degrees of freedom, p=statistically significant, The number and percentage present the answer YES

nurse prescribing among healthcare professionals is critical for evaluating its feasibility and potential implementation in countries like Slovenia and Croatia (9,11,15).

Nurses also identified key prerequisites for implementing prescribing roles, including specialized education, broader pharmacology training, and the establishment of legal frameworks. Slovenian nurses, in particular, emphasized the need for formal specializations and postgraduate education as essential components for safely expanding their professional competencies. These findings are consistent with existing literature, which underscores that structured education and legal clarity are critical for nurse prescribing to be both safe and effective (4, 22, 24).

The results also point to differences in professional behavior and readiness for new roles. Slovenian nurses are more likely to engage in activities such as independent pharmacological learning, attending educational sessions, and using digital tools to sup-

port medication safety. These behaviors suggest a stronger culture of continuous professional development and may reflect a higher degree of preparedness for adopting prescribing responsibilities.

While some European countries have successfully integrated nurse prescribing into nursing practice, others are still in the process of defining legal and educational requirements. Croatia has taken steps in this direction by enabling emergency nurses to prescribe specific medications under strict protocols, indicating a possible pathway for expanding such roles in a controlled and evidence-based manner. In contrast, Slovenia lacks a formal legal framework for nurse prescribing but shows potential for development based on nurses' readiness and interest (13, 14, 15).

Expanding the role of nurses in medication prescribing requires not only educational reform and legal clarity but also interprofessional collaboration. A shared understanding of roles and responsibilities among healthcare providers can foster trust and create a supportive environment for nurses to take on prescribing responsibilities. Studies show that nurse prescribing can improve patient access to care, reduce physician workload, and enhance the quality of pharmaceutical care when properly regulated and supported (12, 25, 26).

In summary, the findings indicate that while nurse prescribing is not yet a common practice in Slovenia, there is a foundation of interest, cautious support, and willingness to engage—especially when prescribing is tied to specialized roles, defined clinical contexts, and proper training. A gradual and well-regulated approach, accompanied by targeted educational measures, appears to be the most acceptable and feasible path toward implementing nurse prescribing in both countries (15, 17, 21).

It is important to emphasize that Croatia is already implementing certain system upgrades in this area (7). With the introduction of a specialization in emergency medical care, nurses are allowed to prescribe medications as specified by regulation. It can be concluded that Croatia is significantly strengthening the autonomy of nurses, while Slovenia is lagging behind in this regard, as the development of nursing specializations is planned for the period up to 2028 (20).

We must acknowledge that nurse prescribing is not legally supported in Slovenia. Precisely because of this, the results reveal shortcomings in the healthcare system, where nurses still find themselves in situations that require them to exceed their formal competencies. It is important to highlight that Croatia is significantly more advanced in developing nursing autonomy through the introduction of specialisations, which also expands the scope of competencies. As a result, nurses in Croatia are legally protected when performing these advanced roles.

The results of this study highlight several important implications for clinical practice and health policy. Educational reform is essential, broader pharmacology education at the undergraduate level and targeted postgraduate courses should be introduced to prepare nurses for prescribing responsibilities. Specialization in nursing should be formally established and linked to defined scopes of prescribing authority. Legal frameworks must be developed to support safe and structured implementation of nurse prescribing, with clearly defined protocols and responsibilities. Interprofessional collaboration should be strengthened to ensure clear role delineation, effective communication, and shared decision-making between nurses, physicians, and pharmacists (9,10). This is further supported by research from Petrović et al. (15), which found that Slovenian nurses experience a strong sense of underrecognition and unequal standing within interprofessional teams—possibly reinforcing their desire for formal prescribing competencies as a way to elevate their professional role.

From a policy perspective, the results from our study suggest that future strategies should prioritise structured postgraduate programs, integration of pharmacology at the undergraduate level, and legislative support for protocol-based prescribing. As emphasise, successful implementation of non-medical prescribing requires a solid foundation of education, support, and regulation. Our data support this view and add context-specific insights into the Slovenian and Croatian healthcare systems (19).

To support safe implementation, it is essential to develop targeted postgraduate programs, strengthen pharmacology education at the undergraduate level, and establish clear legal guidelines. Promoting interprofessional collaboration will also be key. A gradual, evidence-based, and well-regulated approach, informed by countries where nurse prescribing is already established, offers the most appropriate path forward for Slovenia and Croatia.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small (n=185), particularly when divided between Slovenia and Croatia, which limits the generalizability of the results to the wider nursing populations in both countries. The use of voluntary participation and online distribution may have introduced self-selection bias, as individuals with a stronger interest or opinion on nurse prescribing were possibly more inclined to participate. Additionally, the absence of nurse specialists from the Croatian sample—likely due to the recent introduction of postgraduate specialization programs—may have influenced the findings by underrepresenting more prepared or engaged respondents, thus limiting cross-country comparability. The cross-sectional design captures data at a single point in time and does not allow for causal inference or reflection of evolving trends. Moreover, the reliance on self-reported data raises the possibility of social desirability bias, particularly in responses regarding professional behaviors or support for future prescribing roles. Although the questionnaire was informed by existing literature and demonstrated acceptable internal consistency (Cronbach's alpha=0.67), it was newly developed for this study and has not undergone full psychometric validation. The inclusion of both factual and attitudinal items may have resulted in variable interpretation based on respondents' clinical experience, educational background, or familiarity with relevant terminology. Furthermore, notable differences in healthcare systems, educational pathways, and regulatory frameworks between Slovenia and Croatia may have influenced participants' responses and hindered direct comparisons. Finally, the study's exclusively quantitative approach limited the opportunity to explore in-depth perspectives, cultural factors, or professional dynamics that could be better captured through qualitative methods.

Conclusion

This study explored current practices, attitudes, and future perspectives regarding nurse prescribing among nurses in Slovenia and Croatia. The findings show that Slovenian nurses are more frequently engaged in medication-related tasks, including independent medication administration and therapy adjustment. They also report higher involvement in self-directed pharmacological education, participation in industry-led educational sessions, and the use of digital tools for medication support. While legal frameworks for nurse prescribing are largely absent in both countries, nurses are already involved in practices closely related to prescribing.

Nurses in both countries expressed general support for the implementation of nurse prescribing, particularly under clearly defined conditions. Most respondents favoured limitations such as targeted training, restrictions to specific medication types or contexts, and integration within treatment plans. Slovenian nurses more strongly supported measures such as postgraduate education and legal regulation to enable safe prescribing practices. These results offer a foundational understanding of the current state and future possibilities for nurse prescribing in both settings.

Author contributions

Conceptualization and methodology (MPe, MPr); Data curation and formal analysis (MPe, BO); Investigation and project administration (BO, SL); and Writing – original draft and review & editing (MPe, MPr). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflict of interest.

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References

1. Creedon R, Byrne S, Kennedy J, McCarthy S. The impact of nurse prescribing on the clinical setting. Br J Nurs. 2015;24(17):878–85. https://doi.org/10.12968/bjon.2015.24.17.878
2. Adams E. Nurse and midwife medicinal product prescribing in Ireland. In: Kvas A, Lokajner G, Požun P, Sima Đ, editors. Predpisovanje zdravil – izziv medicinskim sestram za prihodnost? Ljubljana: Društvo medicinskih sester, babic in zdravstvenih tehnikov Ljubljana; 2012. Slovenian.
3. International councile of nurses. Predpisovanje zdravil s strani medicinskih sester. In: Kvas A, Lokajner G, Požun P, Sima Đ, editors. Predpisovanje zdravil – izziv medicinskim sestram za prihodnost? Ljubljana: Društvo medicinskih sester, babic in zdravstvenih tehnikov Ljubljana; 2011. Slovenian.
4. Maier CB. Nurse prescribing of medicines in 13 European countries. Hum Resour Health. 2019;17(1):95. https://doi.org/10.1186/s12960-019-0429-6
5. Luetsch K, Rowett D. Interprofessional communication training: benefits to practicing pharmacists. Int J Clin Pharm. 2015;37(5):857–64. https://doi.org/10.1007/s11096-015-0131-2
6. Kroezen M, Francke AL, Groenewegen PP, van Dijk L. Nurse prescribing of medicines in Western European and Anglo-Saxon countries: a survey on forces, conditions and jurisdictional control. Int J Nurs Stud. 2012;49(8):1002–12. https://doi.org/10.1016/j.ijnurstu.2012.02.002
7. Republic of Croatia. Regulation on amendments to the regulation on specialist training of bachelor of nursing in the field of emergency medicine [Internet]. Narodne novine; 2022. Available at: https://narodne-novine.nn.hr/clanci/sluzbeni/2022_11_139_2094.html Accessed: 24.06.2024.
8. De Baetselier E, Van Rompaey B, Batalha LM, Bergqvist M, Czarkowska-Paczek B, De Santis A, et al. EUPRON: nurses practice in interprofessional pharmaceutical care in Europe. A cross-sectional survey in 17 countries. BMJ Open. 2020;10(6):e036269. https://doi.org/10.1136/bmjopen-2019-036269
9. Petrović M, Prosen M, Ličen S, Karnjuš I. Odnos zaposlenih v zdravstveni negi do predpisovanja zdravil: raziskava z rabo mešanih metod. Obzor Zdrav Neg. 2023;57(2):89-99. https://doi.org/10.14528/snr.2023.57.2.3163.
10. Prosen M, Ličen S, Karnjuš I. Vloga medicinskih sester v medpoklicnem sodelovanju v okviru farmacevtske skrbi v Evropi: rezultati EUPRON projekta za Slovenijo. Izola: Univerza na Primorskem, Fakulteta za vede o zdravju; 2018.
11. Nascimento WG, da Costa Uchoa SA, Coelho AA, de Sales Clementino F, Beserra Cosme MV, Bastos Rosa R, et al. Medication and test prescription by nurses: contributions to advanced practice and transformation of care. Rev Lat Am Enfermagem. 2018;26:e3062. https://doi.org/10.1590/1518-8345.2423.3062
12. Kroezen M, van Dijk L, Groenewegen PP, Francke AL. Nurse prescribing of medicines in Western European and Anglo-Saxon countries: a systematic review of the literature. BMC Health Serv Res. 2011;11:127. https://doi.org/10.1186/1472-6963-11-127
13. Bowskill D, Timmons S, James V. How do nurse prescribers integrate prescribing in practice: case studies in primary and secondary care. J Clin Nurs. 2013;22(13-14):2077-86. https://doi.org/10.1111/j.1365-2702.2012.04338.x
14. Heczkova J, Dilles T. Advanced nurses' practices related to pharmaceutical care in the Czech Republic. Nurs 21st Century. 2020;19(3):155–62. https://doi.org/10.2478/pielxxiw-2020-0021
15. Petrović M, Osmančević B, Ličen S, Karnjuš I, Prosen M. Oblikovanje modela medpoklicnega sodelovanja medicinskih sester na področju zagotavljanja farmacevtske skrbi: kvalitativna opisna raziskava. Obzor Zdrav Neg. 2021;55(2):92-101. https://doi.org/10.14528/snr.2021.55.2.3034. Slovenian.
16. World Medical Association. Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4. https://doi.org/10.1001/jama.2013.281053
17. Ling DL, Lyu CM, Liu H, Xiao X, Yu HJ. The necessity and possibility of implementation of nurse prescribing in China: an international perspective. Int J Nurs Sci. 2018;5(1):72–80. https://doi.org/10.1016/j.ijnss.2017.12.011
18. Fong J, Buckley T, Cashin A. Nurse practitioner prescribing: an international perspective. Nurs Res Rev. 2015;5:99–108. https://doi.org/10.2147/NRR.S56188
19. Noblet T, Marriott J, Graham-Clarke E, Rushton A. Barriers to and facilitators of independent non-medical prescribing in clinical practice: a mixed-methods systematic review. J Physiother. 2017;63(4):221–34. https://doi.org/10.1016/j.jphys.2017.09.001
20. Sever M, Bregar B. Specializacije v zdravstveni negi: pogled študentov. Obzornik zdravstvene nege. 2015;49(1):26–43. https://doi.org/10.14528/snr.2015.49.1.49. Slovenian.
21. Debout C. Which education for which nursing competences in the future? Rev Infirm. 2004;(684):54–7.
22. Brown J, Stevens J, Kermode S. Supporting student nurse professionalisation: The role of the clinical teacher. Nurse Educ Today. 2012;32(5):606–10. https://doi.org/10.1016/j.nedt.2011.08.007
23. Goertzen MJ. Introduction to quantitative research and data. Library Technology Reports. 2017;53(4):12–18.

24. Martinkova J. Farmakologie: pro studenty zdravotnických oborů. Praha: Grada; 2019. Czech.
25. De Baetselier E, Van Rompaey B, Dijkstra NE, Sino CG, Akerman K, Batalha LM, et al. The NUPHAC-EU Framework for Nurses' Role in Interprofessional Pharmaceutical Care: Cross-Sectional Evaluation in Europe. Int J Environ Res Public Health. 2021;18(15):7862. https://doi.org/10.3390/ijerph18157862
26. De Baetselier E, Dijkstra NE, Batalha LM, Carvalho Ferreira PA, Filov I, Grøndahl VA, et al. Cross-sectional evaluation of pharmaceutical care competences in nurse education: how well do curricula prepare students of different educational levels? BMC Nurs. 2024;23(1):96. https://doi.org/10.1186/s12912-023-01646-6
27. Osmančević B, Karnjuš I, Ličen S, Prosen M. Perspektiva medicinskih sestara o njihovoj ulozi u farmacevtskoj skrbi: Uporedba između Slovenije i Hrvatske. Sestrinski glasnik. 2021;26(2):115-9. https://doi.org/10.11608/sgnj.26.2.5. Croatian.