ORIGINAL RESEARCH

The Experiences of Nursing Students, Mentors and Teachers Regarding eMedication Passport Use in Clinical Practice: A Feedback Survey

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Keywords: *eMedication Passport, nursing students, mentors, teachers.*

Summary. *The improvement of graduating nurse competence is essential in order to provide safe and professional patient care. The eMedication Passport was introduced as a digital learning tool with the aim of determining whether nursing students have the essential skills to practice medication management safely in health care.*

The purpose of the study was to investigate feedback from Estonian, Latvian and Lithuanian nursing students, mentors and teachers after their use of the eMedication Passport.

This study was an analysis of quantitative and qualitative data taken from open-ended online questionnaires completed anonymously on the Webropol 3.0 platform.

The positive feedback on the use of eMedication Passport was most pronounced from Estonian nursing students, followed by Latvian and Lithuanian students. In most cases, nurse mentors and teachers did not cooperate when evaluating the development of students' medication competence.

All respondents emphasized the need for closer cooperation to improve medication competence with the use of the eMedication Passport.

Introduction

A number of published studies have focused on finding ways to improve students' skills and competences in the prevention of medication errors. Studies in Ireland have revealed that nurse educators continue to seek and employ new innovative methods to prepare students, including oral medication administration simulations (1). Medication competence as a profound knowledge base in pharmacology, pharmacy and medication management of medical students is an essential factor in increasing the medication care safety of patients (2). It is known that medication error prevention plays an essential role in nursing care (3).

The incidence of medication errors is still a relevant and worrisome fact that needs to be taken into account (4–6). In addition, for many reasons, we still face the fact that the nursing profession continues to experience a shortage in regard to personnel (7). Therefore, emphasis must be placed on ensuring the skills and competence of nursing students. To achieve better skills in medication therapy and thus to reduce the number of errors, it is important to guarantee good communication between nursing students, academic teachers and mentors. This goal is in agreement with studies in which the authors have asserted that it is crucial for nursing students to make a competent pharmacological decision when administrating medications, thus reducing the number of medication errors (8). To improve and to provide good decision-making capabilities of nurses, both academic teachers and clinical mentors must be involved in the learning process (9, 10).

Previously, feedback from interviews with nursing students has shown that medication error-committing factors were mainly due to the lack of supervision by graduate nurses, as well as a loss of focus and stress and fatigue (11). In other studies, undergraduate students have revealed that the use of technologies in the medication process gives them confidence; yet, experienced nurses do not follow all the existing guidelines, which gives students a sensation of inaccessibility in practical learning situations (12). This finding leads to the conclusion that the supervision of nursing students by mentors or teachers is crucial in terms of medication competence. In some reports, nurses have stressed that nursing student supervision promotes their learning and ensures quality of care (13).

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In previous studies, it has been found that medication safety-enhanced and simulation-based learning experience studies improve student learning outcomes and might ensure patient safety (14–16). Different active learning, gaming and social media strategies have been proposed to aid and to enhance nursing student knowledge of pharmacology (17). In a study by Hewitt et al., problem-based learning applied to nursing students encouraged them to analyze the potential factors that can lead to medication error prevention (18). To improve nursing student competence and to prevent medication errors, Lee and Quinn reviewed three relevant themes – simulation experiences, technology aids and online learning modules – although the outcomes of these studies were different (16). Recently, a drug administration assessment instrument was introduced to help nursing students avoid medication errors. In addition, this instrument provides the valuation of competence and consistent feedback (19).

The eMedication Passport, as a portal-based innovative digital learning tool, was introduced in Finland with the aim of determining whether graduating students have the required knowledge and skills to practice medication management safely in health care. The eMedication Passport offers common learning and evaluation techniques to enhance medication competence at the bachelor's level of nursing education. The purpose of the passport is to support the student in the learning process of pharmacology and medication administration. At the same time, this approach includes the tasks of multiprofessional collaboration and patient education and the support of compliance. The learning task outline should be completed by the student during clinical practice training under the observance and responsibility of a clinical nurse mentor. One of the bases of the eMedication Passport is the previously described medication competence of graduating nurses (20).

The eMedication Passport as a nurse student personal document includes theoretical studies and clinical practice skills. Moreover, the intention of this Passport is to promote a link among nursing students, their mentors and teachers to improve graduating nurse competence.

The aim of this research was to clarify the opinion and feedback from Latvian, Estonian and Lithuanian nursing students, mentors and teachers after the use of the eMedication Passport in their clinical practice.

Methods

Participants. A quantitative study with the survey method was performed as a part of the ERASMUS+ program strategic partnership project "The eMedication Passport – cultural adaptation of a learning tool for ensuring the development of medication competence of graduate nurses". The participants were taken from three different target groups – third-year undergraduate nursing students, mentors at clinics and nursing teachers from higher education institutions in Latvia, Estonia and Lithuania. Based on successful eMedication Passport use in Finland, project coordinators from Finland and Estonia invited medical colleges from Estonia, Latvia and Lithuania to participate in the new project. All colleges gave positive answers. The main criteria were a study program in nursing and interest to develop and adopt a new innovative tool in a study process.

Before the feedback survey, students performed their clinical practice at the hospital and gained results written through the eMedication Passport. Mentors supported students during the practice period and gave evaluations to each participant. Nursing teachers were involved in giving support and educating students, if needed, during that period. The feedback on the use of the eMedication Passport in clinical practice involved 100 undergraduate nursing students (14 from Estonia, 25 from Latvia and 61 from Lithuania), 19 mentors (12 from Estonia, 3 from Latvia and 4 from Lithuania) and 5 teachers (2 from Estonia, 3 from Latvia and no one from Lithuania).

The purpose of the survey was to evaluate participant experiences with regard to using the eMedication Passport and how it supported the development of nursing student medication competences and experiences with its usability. The survey was sent to all nurse mentors who supervised students using the eMedication Passport, to students who used the Passport and to teachers who were involved in the study process.

To collect feedback data, the project team conducted three different surveys for each participant group. Definite questions (e.g., the country and the evaluation of medication competences; does the eMedication Passport help students follow the development process in clinical practice; is the structure of the content clear and easy-to-use; and how often do participants make entries in the eMedication Passport) were common in all groups. Differences were found in the questions about the study semester, unit, and where mentors were working.

Questionnaires for students were translated from English versions to Latvian, Estonian and Lithuanian languages. Teachers and nurse mentors filled out English versions of the questionnaire.

Data Collection. An online questionnaire survey was performed anonymously on the Webropol 3.0 platform during the period from May 2019 to October 2019. A link to the questionnaire was sent to participants by e-mail and included students, teachers and mentors.

Data Analysis. The data collected by the Webropol 3.0 platform were saved in the Microsoft Office Excel program and analyzed by the statistical software RStudio. Descriptive statistics were used in this study to evaluate the distribution of the data by the percentage, frequency and median values.

Ethical Considerations. The study was approved by ethical boards of three higher education institutions participating in the project (Grant Agreement 2017-KA203-01). Afterwards, nursing students who had used the eMedication Passport in their clinical practice, clinic mentors and teachers were invited to participate in the study to give feedback about the use of the eMedication Passport. The students, mentors and teachers were assured that all their information would remain confidential and that their questionnaires were anonymous. Respondents were informed by researchers that their participation was voluntary.

Description of Research Instruments. Research instruments were three different questionnaires for all target groups – students, mentors and teachers who participated in the project. The purpose was to evaluate student, mentor and/or teacher experiences in using the eMedication Passport, how it supports the development of nursing student medication competence and respondent experiences in its usability. Medication competence consists of a nurse theoretical, practical, and decision-making competence. It is interrelated and linked to the nurse values and attitudes and associated with the nursing setting and the individual situation of the patient. The questionnaires consist of open-ended and close-ended questions. The Turku University of Applied Sciences, Finland developed questionnaires as they produced the eMedication Passport. Adaption process of the questionnaire was made by each country according to the national regulations of nursing education.

Results

Student Feedback. All Estonian students (100%), the majority of Latvian students (76%) and only 18% of Lithuanian students answered that they had actively used the eMedication Passport. Estonian students greatly agreed that the eMedication Passport helped them to identify the medication competence that is required from nurses. Students from Latvia and Lithuania gave less positive and more neutral responses (Table 1).

Estonian and Latvian students agreed that the structure of the content in the eMedication Passport was clear and the eMedication Passport was easy to use; however, Lithuanian students also gave neutral and negative answers (Table 1).

The eMedication Passport helped Estonian, Latvian and Lithuanian students follow their own development process during clinical practice (very well/rather well) in skills related to medication management and theoretical knowledge of medication management (79%, 56% and 33%, respectively). For the Estonian students, the Passport also helped with theoretical knowledge of medication management (65%) and special skills in medication management (57%).

Students from Estonia and Latvia utilized the eMedication Passport when evaluating their own medication competence and its development, when developing the objectives for clinical practice and when they described to their nurse mentors the medication skills that they should learn. In contrast, the Lithuanian students utilized the eMedication Passport rarely. Estonian, Latvian and Lithuanian

Table 1. Students' opinion on the eMedication Passport use, (n = 100)

Statement	Country, n	Answers, %		
		Very well / Rather well	Neither well nor poorly	Rather poorly / Very poorly
The eMedication Passport helps to identify medication competence	Estonia (n = 14)	93	7	0
	Latvia (n = 25)	60	28	12
	Lithuania (n = 61)	32	42	26
		Strongly agree / agree	Neither agree nor disagree	Disagree / Strongly disagree
The structure of the content in the eMedication Passport is clear	Estonia (n = 14)	65	14	21
	Latvia (n = 25)	60	28	12
	Lithuania (n = 61)	36	37	27
The eMedication Passport is easy to use	Estonia (n = 14)	93	0	7
	Latvia (n = 25)	60	28	12
	Lithuania (n = 61)	40	40	20

students all gave mostly negative responses about the use of the eMedication Passport on their mobile devices. However, those students who used it agreed that the mobile version was easy to use.

Estonian students agreed that the learning tasks related to medication skills were meaningful (79%) and that instructions from the teacher when starting to use the eMedication Passport were helpful (98%). However, they disagreed that instructions from the teacher when using the eMedication Passport were needed (93%). Latvian students declared that instructions from the teacher when using the eMedication Passport were helpful for starting its use (92%). The students disagreed that mentors had motivated and reminded them to use the eMedication Passport during clinical practice. Lithuanian students negatively evaluated mentor knowledge of the eMedication Passport (57%), and their ability to motivate (57%) and to remind (58%) students to use the eMedication Passport (Table 2).

During clinical practice, mainly Latvian students made entries in the eMedication Passport for medication skills, medication calculation skills and special skills in medication management, followed by Estonians and Lithuanians. Students from all three Baltic States evaluated the development of their medication competence with the help of the learning tasks in the eMedication Passport, mainly independently, only sometimes with the mentor, but rarely or never with the teacher (Table 3).

Table 2. Evaluation of certain statements about eMedication Passport use from the student perspective, (n = 100)

Statement	Country, n	Answers, %			Average	Median
		Strongly agree / Agree	Neither agree nor disagree	Disagree / Strongly disagree		
The learning tasks related to medication skills described in the eMedication Passport are meaningful	Estonia (n = 14)	79	21	0	2.2	2
	Latvia (n = 25)	52	36	12	2.5	2
	Lithuania (n = 61)	43	35	22	2.8	3
Instructions from the teacher for using the eMedication Passport were needed	Estonia (n = 14)	0	7	93	4.5	4
	Latvia (n = 25)	84	12	4	1.9	2
	Lithuania (n = 61)	50	33	17	2.5	2.5
Mentors motivated students using the eMedication Passport during clinical practice	Estonia (n = 14)	29	43	28	3.1	3
	Latvia (n = 25)	20	20	60	3.6	4
	Lithuania (n = 61)	16	27	67	3.9	4
Mentors reminded students about using the eMedication Passport during clinical practice	Estonia (n = 14)	21	29	50	3.6	3.5
	Latvia (n = 25)	28	12	60	3.5	4
	Lithuania (n = 61)	14	28	58	3.9	4

Table 3. Students' opinions on the development of their medication competence with the help of the learning tasks in the eMedication Passport, (n = 100)

Statement	Type of evaluation	Country	Answers, %			Average	Median
			Always/ Often	Sometimes	Rarely/ Never		
Evaluation of the development of medication competence with the help of learning tasks in the eMedication Passport	Independently	Estonia (n = 14)	43	36	21	2.9	3
		Latvia (n = 25)	40	44	16	2.6	3
		Lithuania (n = 61)	27	25	48	3.5	3
	Together with the mentor	Estonia (n = 14)	21	43	36	3.1	3
		Latvia (n = 25)	20	20	60	3.8	4
		Lithuania (n = 61)	9	20	72	4.2	5
	Together with the teacher	Estonia (n = 14)	7	7	86	4.4	5
		Latvia (n = 25)	16	20	64	3.8	4
		Lithuania (n = 61)	7	15	78	4.4	5

Students from Estonia occasionally made entries in the eMedication Passport during clinical practice (64%). Latvian students mainly did so occasionally during clinical practice (36%) and at the end of clinical practice (36%). Lithuanian students (36%) made entries at the end of the clinical practice or not at all. Estonian students (71%) asked the mentor to make entries at the end of clinical practice. Most of the Latvian (64%) and Lithuanian (74%) students did not ask the mentor to make any entries. The average time that students spent using the eMedication Passport during their clinical practice was 6.5 hours for Estonian students, 25 hours for Latvian students and 1.36 hours for Lithuanian students.

Estonian students evaluated the eMedication Passport well as a learning tool that suits their country. Latvian and Lithuanian students gave more neutral answers. In the open-ended questions, such as those regarding the development of the eMedication Passport, students reported that the use of the eMedication Passport was time consuming and not always clearly defined, that it should be enriched, and that students were in need of more help from mentors.

Mentor Feedback. Estonian, Latvian and Lithuanian mentors stated that the eMedication Passport helped well to identify medication competence, which is required from the nurse (Table 4). Mentors from Estonia said that the eMedication Passport helped them neither well nor poorly (58%) and rather poorly (17%) to follow student development in medication calculations. Mentors from Latvia and Lithuania agreed that the eMedication Passport helped them quite well to follow student development in medication management skills and theoretical knowledge, in medication calculation and in special skills in medication management.

Mentors from all three Baltic States acknowledged that their supervised students utilized the eMedication Passport on average quite often. Mentors also agreed that the structure of the content in the eMedication Passport was clear and easy to use (Table 4). None of the mentors used the eMedication Passport on their mobile devices.

Mentors also had to give their opinions on the relevance and comprehensibility of learning tasks related to the medication skills described in the eMedication Passport and the involvement of students, teachers and themselves in the use of the eMedication Passport. Some mentors from Estonia, Latvia and Lithuania neither agreed nor disagreed that the use of the eMedication Passport was sensible. Estonian mentors disagreed that the scale for medication skills "Observed-Practiced-Competent" was suitable for medication skill assessment and that teachers reminded students to use the eMedication Passport. Almost half of them neither agreed nor disagreed that mentors themselves reminded students to use the eMedication Passport. Half of the Lithuanian mentors neither agreed nor disagreed that students used the eMedication Passport actively.

On average, all mentors admitted that students often made entries in the eMedication Passport. However, 25% of Estonian and 33% of Latvian mentors answered that students only sometimes made entries regarding medication calculation skills, and 33% of Latvian and 50% of Lithuanian mentors answered that they did so for special skills in medication management. Estonian mentors in 8% and 9% of cases also said that students never made entries for medication calculation skills and for special skills in medication management, respectively.

Estonian mentors never assessed the development of student medication competence with the help of the learning tasks in the eMedication Passport together with the teacher; more often, they did so independently or with the student. Mentors from Latvia assessed the development of student medication competence with the help of the learning tasks in the eMedication Passport often independently or

Table 4. Mentors' opinion on the eMedication Passport use, (n = 19)

Statement	Country, n	Answers, %		
		Very well / Rather well	Neither well nor poorly	Rather poorly / Very poorly
The eMedication Passport helps to identify medication competence	Estonia (n = 12)	92	8	0
	Latvia (n = 3)	100	0	0
	Lithuania (n = 4)	100	0	0
		Strongly agree / agree	Neither agree / nor disagree	Disagree / strongly disagree
The structure of the content in the eMedication Passport is clear	Estonia (n = 12)	92	8	0
	Latvia (n = 3)	100	0	0
	Lithuania (n = 4)	100	0	0

together with the student; however, 33% of mentors never did so together with the teacher. Mentors from Lithuania rarely evaluated the development of student medication competence with the help of the learning tasks in the eMedication Passport independently; with the answers ranging from always to sometimes, they did so together with the student and teacher (Table 5).

Mentors responded that they spent an average of 2.4 hours (Estonians), 4.3 hours (Latvians) and 8 hours (Lithuanians) using the eMedication Passport during student clinical practice. Estonian mentors occasionally (83%) made entries to the eMedication Passport during student clinical practice. Mentors from Latvia and Lithuania did so mostly at the end of clinical practice (100% and 75%, respectively).

In open-ended questions, mentors emphasized the positive aspects of the eMedication Passport, such as its ease of use, e-medicine management and student supervision. The obstacles that prevented the use of the eMedication Passport were high workload, linguistic barriers and high time consumption. Mentors proposed developing the eMedication Passport by shortening and merging similar sections and adding real tasks.

Teacher Feedback. Teacher feedback results were received only from Estonia and Latvia. All teachers replied that the eMedication Passport helped to identify medication competence very well. Estonian teachers gave negative feedback on helping in medication calculations (100%). Teachers from Latvia pointed out that the eMedication Passport helped rather well in medication management skills and theoretical knowledge but rather poorly (33%) in medication calculations and neither well nor poorly (67%) in special skills in medication management.

Teachers from Estonia answered that their supervised students quite often utilized the eMedication Passport, although the answers from Latvian teachers were divided between quite often and rarely. All teachers admitted that the structure of the content in the eMedication Passport was clear and easy usable.

Teachers from Estonia responded that, during clinical practice, students always and often made entries to the eMedication Passport for medication skills but only sometimes for medication calculation skills and sometimes or rarely for special skills in medication management. Similar results were observed in the responses of Latvian teachers.

Teachers from Estonia and Latvia evaluated the development of student medication competence with the help of the learning tasks in the eMedication Passport often or sometimes independently or together with the student; yet, 50% of Estonian and 67% of Latvian teachers never did it together with the mentor (Table 6).

Estonian and Latvian teachers on average spent 10 hours using the eMedication Passport during the student clinical practice. The eMedication Passport as a learning tool was evaluated as suitable as well for both countries. In open-ended questions, teachers revealed that information, the manual and individual tutoring helped in the use of the eMedication Passport; however, they also pointed out time limitations and long diaries, which demotivated the mentors. Teachers proposed shortening and correcting the eMedication Passport and providing broader explanations of the criteria.

Discussion

The eMedication Passport was introduced as a personal document of nursing students with theoretical studies and clinical practice skills to improve medication competence and to improve collaboration among academic and clinical institutions (20).

Table 5. Mentors' opinion on the development of student medication competence with the help of the learning tasks in the eMedication Passport, (n = 19)

Statement	Type of evaluation	Country, n	Answers, %			Average	Median
			Always/ Often	Sometimes	Rarely/ Never		
Evaluation of the development of student medication competence with the help of learning tasks in the eMedication Passport	Independently	Estonia (n = 12)	40	30	30	2.9	3
		Latvia (n = 3)	100	0	0	2.0	2
		Lithuania (n = 4)	0	0	100	4.0	4
	Together with the student	Estonia (n = 12)	73	9	18	2.2	2
		Latvia (n = 3)	67	33	0	2.3	2
		Lithuania (n = 4)	50	50	0	2.3	2.5
	Together with the teacher	Estonia (n = 12)	0	0	100	4.8	5
		Latvia (n = 3)	34	33	33	3.3	3
		Lithuania (n = 4)	75	25	0	2.0	2

Table 6. Teachers' opinion on the development of student medication competence with the help of the learning tasks in the eMedication Passport, (n = 5)

Statement	Type of evaluation	Country, n	Answers, %			Average	Median
			Always/ Often	Sometimes	Rarely/ Never		
Evaluation of the development of student medication competence with the help of learning tasks in the eMedication Passport	Independently	Estonia (n = 2)	100	0	0	1.5	1.5
		Latvia (n = 3)	33	67	0	2.7	3
		Lithuania (n = 0)	–	–	–	–	–
	Together with the student	Estonia (n = 2)	0	50	50	3.5	3.5
		Latvia (n = 3)	33	67	0	2.7	3
		Lithuania (n = 0)	–	–	–	–	–
	Together with the mentor	Estonia (n = 2)	0	50	50	4	4
		Latvia (n = 3)	0	33	67	4.3	5
		Lithuania (n = 0)	–	–	–	–	–

The aim of this study was to evaluate the eMedication Passport experience among Latvian, Estonian and Lithuanian nursing students, mentors and teachers in three higher education institutions. In general, students, mentors and teachers agreed that the eMedication Passport helped to identify medication competence, which is required from nurses. Though students from Lithuania rated this statement worse, there was no feedback received from Lithuanian teachers.

Students agreed that the eMedication Passport helped them to follow their own development process; this response was more pronounced in Estonian students and less pronounced in Lithuanian students. Mentors and teachers had the same opinions; yet, Estonian mentors and teachers and Latvian teachers had some difficulties in following student development in medication calculations. Interestingly, mentors and teachers responded that their students utilized the eMedication Passport when evaluating their medication competence and development; however, the majority of Lithuanian students disagreed with this statement.

In general, students, mentors and teachers agreed that the eMedication Passport was easy to use; yet among students, Lithuanian students gave the least positive answers, Latvian students gave more positive answers and Estonian students gave the most positive answers. In addition, the majority of respondents did not use the eMedication Passport with their mobile devices.

In the statement where students, mentors and teachers had to evaluate the tasks and instructions of the eMedication Passport and the role of each one in this process, students mainly criticized the knowledge of mentors, as well as their lack of motivating and reminding them to use the eMedication Passport. Mentors mostly gave neutral responses to these statements, and Estonian mentors reported that they did not have enough involvement from teachers in this process. Teachers pointed out that not all students used the eMedication Passport actively and that mentors could motivate them more. Therefore, it seems that nursing students are not so skilled in clinical practice, and they need support, supervision and management from mentors and teachers. In addition, there was also a lack of the necessary exchange of information and knowledge between mentors and teachers to ensure student medication competence.

These results are in good accordance with previous studies, where the conclusions stated that it is of great importance to provide supervision from mentors and academic teachers to undergraduate nursing students and hence to improve their medication competence and to reduce medication errors (11–13). Other studies have revealed that graduating nursing students are not sufficiently prepared in terms of medication competence and management (21, 22). Kajader-Unkuri and others stated that the professional competence of nursing students can lead to better patient care, quality and safety (23). The ability to administer medications safely and to integrate theory into practice is essential for nursing students (24, 25).

The results from this study showed that the evaluation of student development of medication competence with the help of the learning tasks in the eMedication Passport was made mostly independently among students, mentors and teachers. This tendency was observed among respondents from all three Baltic States. All three groups of respondents replied that the eMedication Passport suited their country; yet, students evaluated this statement more neutrally. Students, mentors and teachers emphasized that although the eMedication Passport was

useful for e-medicine and student supervision, it could be shortened, more clearly defined and involve all three groups more.

It seems that supervision and support from nurse mentors, as well as collaboration between academic and clinical staff, as described earlier (10), are still unresolved issues. The organization of nursing studies may need to be regularly reviewed and improved. This finding is in line with the review study by Dahlke et al., who concluded that nursing students did not receive sufficient support from their academic teachers and clinical mentors to develop their clinical practice skills (26). Another study showed that students undervalued the skills of their instructors to teach pharmacology and medication management (27). Similarly, Preston and others specifically emphasized pharmacological education as essential among nursing students to build a better clinical experience (28). Multidisciplinary collaboration was put forward to improve nursing student skills in clinical practice earlier (29). Mettiäinen and others previously emphasized that the improvement of nursing student medication competence was very important prior to graduation (30).

Limitations

This study had some limitations. The results cannot be reflected as illustrative since we had a considerably low responses from teachers. Besides, we did not obtain feedback from Lithuanian teachers. Findings of the study cannot be generalized, yet the results reflect experience and opinion about the system in the Baltic States. Respondents pointed out that some statements used in eMedication Passport were complicated; therefore, it would be desirable to illustrate more general and precise data.

Conclusions

Although feedback from nursing students, mentors and teachers on the eMedication Passport was generally affirmative, there are still various obstacles to its effective implementation. Better communication and closer collaboration between nursing students, mentors and teachers are needed to achieve superior results. Assessing respondents' feedback, the eMedication Passport should be made less complicated and more focused, which will ensure better medication competence and thus improve patient safety by reducing medication errors.

Conflict of Interest

The authors indicated no potential conflicts of interest.

Acknowledgements

This research was supported by the European Commission under the Erasmus+ program, grant [2017-1-EE01-KA203-034884].

References

1. Cleary-Holdforth J, Leufer T. Senior nursing students' perceptions of their readiness for oral medication administration prior to final year internship. Dimens Crit Care Nurs 2020;39(1):23-32. doi: 10.1097/DCC.0000000000000401.
2. Sulosaari V, Huupponen R, Hupli M, Puukka P, Torniainen K, Leino-Kilpi H. Factors associated with nursing students' medication competence at the beginning and end of their education. BMC Med Educ 2015;15:223. doi: 10.1186/s12909-015-0513-0.
3. Duarte SCM, Stipp MAC, Silva MM, Oliveira FT. Adverse events and safety in nursing care. *Rev* Bras Enferm 2015;68(1):144-54. DOI: 10.1590/0034-7167.2015680120p.
4. Makary MA, Daniel M. Medical error – the third leading cause of death in the US. BMJ 2016;353:i2139. doi: 10.1136/bmj.i2139.
5. Bates DW. Preventing medication errors: a summary. *Am J Health Syst Pharm 2007;*64(14 Suppl 9):S3-9. doi: 10.2146/ajhp070190.
6. Weeks KW, Sabin M, Pontin D, Wooley N. Safety in numbers: an introduction to the Nurse education in Practice series. Nurse Educ Pract 2013;13(2):e4-e10. doi: 10.1016/j.nepr.2012.06.006.
7. Haddad LM, Annamaraju P, Toney-Butler TJ. Nursing shortage. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing LLC; 2020.
8. Lim AG, Honey M. Integrated undergraduate nursing curriculum for pharmacology. Nurse Educ Pract 2006;6(3):163-8.
9. Lim AG, Honey M. *New Zealand* newly graduated nurses medication management: results of a survey. Nurse Educ Pract 2014;14(6):660-5.
10. Vaismoradi M, Jordan S, Turunen H, Bondas T. Nursing students' perspectives of the cause of medication errors. Nurse Educ Today 2014;34(3):434-40.
11. Reid-Searl K, Moxham L, Happell B. Enhancing patient safety: the importance of direct supervision for avoiding medication errors and near misses by undergraduate nursing students. Int J Nurs Pract 2010;16(3):225-32.
12. Orbæk J, Gaard M, Fabricius P, Lefevre RS, Møller T. Patient safety and technology-driven medication – A qualitative study on how graduate nursing students navigate through complex medication administration. Nurse Educ Pract 2015;15(3):203-11.
13. Reid-Searl K, Happell B. Supervising nursing students administering medication: a perspective from registered nurses. J Clin Nurs 2012;21(13-14):1998-2005.
14. Mariani B, Ross JG, Paparella S, Allen LR. Medication safety simulation to assess student knowledge and competence. Clin Simul Nurs 2017;13(5):210-6.
15. Green C. Contemporary issues: the pre-licensure nursing student and medication errors. Nurse Educ Today 2018;68:23-5.
16. Lee SE, Quinn BL. Incorporating medication administration safety in undergraduate nursing education: a literature review. Nurse Educ Today 2019;72:77-83.
17. Morales KA. Active learning strategies to enhance nursing students' knowledge of pharmacology. Nurs Educ Perspect 2017;38(2):100-2.
18. Hewitt J, Towe M, Latimer S. An education intervention to improve nursing students' understanding of medication safety. Nurse Educ Pract 2015;15(1):17-21.
19. *Cancino* KD, *Arias* M, Caballero E, Escudero E. Development of a safe drug administration assessment instrument for nursing students. Rev Lat Am Enfermagem 2020;28:e3246.

20. Sulosaari V, Suhonen R, Leino-Kilpi H. An integrative review of the literature on registered nurses' medication competence. J Clin Nurs 2011;20(3-4):464-78.
21. Meechan R, Mason V, Catling J. The impact of an integrated pharmacology and medicines management curriculum for undergraduate adult nursing students on the acquisition of applied drug/pharmacology knowledge. Nurse Educ Today 2011;31(4):383-9.
22. Simonsen BO, Daehlin GK, Johansson I, Farup PG. Differences in medication knowledge and risk of errors between graduating nursing students and working registered nurses: comparative study. BMC Health Serv Res 2014;14:580.
23. Kajander-Unkuri S, Meretoja R, Katajisto J, Saarikoski M, Salminen L, Suhonen R, Leino-Kilpi H. Self-assessed level of competence of graduating nursing students and factors related to it. Nurse Educ Today 2014;34(5):795-801.
24. Morrison-Griffiths S, Snowden MA, Pirmohamed M. Preregistration nurse education in pharmacology: is it adequate for the roles that nurses are expected to fulfil? Nurse Educ Today 2002;22(6):447-56.
25. Harris MA, Pittiglio L, Newton SE, Moore G. Using simulation to improve the medication administration skills of undergraduate nursing students. *Nurs Educ Perspect 2014;*35(1):26-9.
26. Dahlke S, Baumbusch J, Affleck F, Kwon JY. The clinical instructor role in nursing education: a structured literature review. J *Nurs Educ 2012;*51(12):692-6.
27. Ghamari-Zare Z, Adib-Hajbaghery M. Performance of clinical nurse educators in teaching pharmacology and medication management: nursing students' perceptions. *Nurs Midwifery* Stud 2016;5(1):e29913.
28. Preston P, Leone-Sheehan D, Keys B. Nursing student perceptions of pharmacology education and safe medication administration: a qualitative research study. Nurse Educ Today 2019;74:76-81.
29. Leufer T, Cleary-Holdforth J. Let's do no harm: medication errors in nursing: part 1. Nurse Educ Pract 2013;13(3):213-6.
30. Mettiäinen S, Luojus K, Salminen S, Koivula M. Web course on medication administration strengthens nursing students' competence prior to graduation. Nurse Educ Pract 2014;14(4):368-73.

Received November 2021
Accepted January 2022