

Safe use of medications: learning needs and strengths for teaching mediated by virtual technologies

Uso seguro de medicações: necessidades de aprendizagem e potencialidades para ensino mediado por tecnologias virtuais
Uso seguro de medicamentos: necesidades de aprendizaje y potencialidades para la enseñanza mediada por tecnologías virtuales

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Abstract

Objective: To identify the learning needs of undergraduate nursing students about patient safety and medication safety. **Methods:** Descriptive and cross-sectional study, developed from March 2019 to December 2020, with a non-probabilistic and intentional sample consisting of 45 undergraduate nursing students. Data were analyzed using descriptive statistics. **Results:** There was a predominance of female students (73.3%) with family income between 1 and 2 minimum wages. All confirmed having access to the internet, with a daily frequency of use by participants (93.3%). The smartphone was the most used device to access the internet (77.8%), with the home being the predominant place of access (80.0%). Regarding the learning needs about patient safety and medication safety, the classification “essential” stood out among the evaluated questions. **Conclusion:** The main identified learning needs of the participants were: working effectively as part of a team, understanding the systems and the effect of the complexity of patient care and defining the key concepts. In addition to that, there were weaknesses in differentiating between common terms in the medication administration process.

Descriptors: Education, Nursing; Patient Safety; Drug Therapy; Technology.

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Whats is already known on this?

There is a need for nursing students to intensify learning about the topics “patient safety” and “medication safety”.

What this study adds?

The article identifies knowledge gaps among undergraduate nursing students regarding the recognition of concepts, systems, human factors and other mechanisms for promoting patient safety and medication safety.



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Resumo

Objetivo: Identificar as necessidades de aprendizagem de graduandos de enfermagem sobre segurança do paciente e segurança medicamentosa. **Métodos:** Estudo descritivo, transversal, desenvolvido no período de março de 2019 a dezembro de 2020, com amostra não probabilística e intencional constituída por 45 graduandos de enfermagem. Os dados foram analisados por meio de estatística descritiva. **Resultados:** Houve predomínio de estudantes do sexo feminino (73,3%) com renda familiar entre 1 e 2 salários mínimos. Todos confirmaram ter acesso à internet, com frequência diária de uso de participantes (93,3%). O smartphone foi o aparelho mais utilizado para acesso à internet (77,8%), tendo o domicílio como local predominante de acesso (80,0%). Sobre as necessidades de aprendizagem acerca da segurança do paciente e da segurança medicamentosa, destacou-se a classificação “essencial” dentre as questões avaliadas. **Conclusão:** Identificaram-se como as principais necessidades de aprendizagem dos participantes: atuar em equipe de forma eficaz, compreender os sistemas e o efeito da complexidade dos cuidados ao paciente e definição dos conceitos-chaves. Junto a isso, verificaram-se fragilidades de diferenciação entre os termos comuns no processo de administração de medicamentos.

Descritores: Educação em Enfermagem; Segurança do Paciente; Tratamento Farmacológico; Tecnologia.

Resumen

Objetivo: Identificar las necesidades de aprendizaje de los estudiantes de enfermería sobre seguridad del paciente y seguridad de los medicamentos. **Métodos:** Estudio descriptivo, transversal, desarrollado desde marzo de 2019 hasta diciembre de 2020, con muestra no probabilística e intencional compuesta por 45 estudiantes de enfermería. Los datos fueron analizados mediante estadística descriptiva. **Resultados:** Hubo predominio de estudiantes del sexo femenino (73,3%) con ingresos familiares entre 1 y 2 salarios mínimos. Todos confirmaron tener acceso a internet, con una frecuencia de uso diaria por parte de los participantes (93,3%). El teléfono inteligente fue el dispositivo más utilizado para acceder a internet (77,8%), siendo el hogar el lugar predominante de acceso (80,0%). En cuanto a las necesidades de aprendizaje sobre seguridad del paciente y seguridad de los medicamentos, entre las cuestiones evaluadas, se destacó la clasificación “esencial”. **Conclusión:** Las principales necesidades de aprendizaje identificadas en los participantes fueron: trabajar eficazmente en equipo, comprender los sistemas y el efecto de la complejidad de la atención al paciente y definir conceptos clave. Junto a ello, se notaron debilidades en la diferenciación entre términos comunes en el proceso de administración de medicamentos.

Descritores: Educación en Enfermería; Seguridad del Paciente; Quimioterapia; Tecnología.

INTRODUCTION

Patient safety comprises a set of actions, the organization of which has important consequences, namely: creation of new cultures, behaviors, processes, methods, technologies and environments that, when correctly implemented in the health context, increase the power to reduce risks and decrease the occurrence of avoidable damage, in addition to greatly reducing the impact of damage and/or error when it occurs.⁽¹⁾ It is a topic that has gained worldwide notoriety since the late 1990s, due to the release of the report prepared by the US Institute of Medicine entitled “To err is human”, which revealed that around 44,000 to 98,000 Americans died every year in the United States from adverse events and that around 7,000 deaths were related to medication errors (ME).⁽²⁻³⁾

Adverse events are any incidents that result in harm to the patient.⁽⁴⁾ Their occurrence may be linked to systemic factors, involving strategies, culture, work practices, quality management, risk prospecting and the ability to learn from errors.⁽³⁾ When related to medications, these events can entail relevant social and economic repercussions and significant harm to the health conditions of patients.⁽⁵⁾

According to the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), medication error is any and all preventable event that may trigger the inappropriate use of medications, regardless of whether or not it is under the control of the health professional or the patient himself/herself.⁽⁶⁾ ME are considered multifactorial and significant sources of morbidity and mortality⁽⁷⁾, which demands a consolidated safety culture among health and education services, where those involved (students and professionals) in the stages of the process (prescription, dispensing, administration and monitoring) are aligned with actions to prevent their occurrence.

When related to professional practice, ME make the nursing team evident, as this represents more than 50% of the workforce in health services, and these professionals are responsible for part of the medication process, that is, they are directly involved in the administration and monitoring phases. Therefore, they have the power not only to defend patient safety, but to make a significant impact on reducing errors.⁽⁷⁻⁹⁾

A study carried out in a hospital in the state of Bahia about the notification of incidents related to the medication chain points to administration errors at 52.36% as the main types of notified incidents, followed by prescription errors (22.32%) and dispensing errors (16.31%).⁽¹⁰⁾ A similar reality was also found in the state of São Paulo.⁽¹¹⁾

From this perspective, it is believed that effective teaching during undergraduate studies is an important starting point for advancing patient safety in the domains of knowledge, attitude and skills in

the preparation of future nurses. Nonetheless, safe practice requires clinical skills and an appropriate level of clinically relevant knowledge.⁽¹²⁾ Therefore, ensuring that nursing students have the skills and knowledge needed for safe and effective practice has become a key priority for universities.⁽⁹⁾

Patient safety is a determining factor in the quality of care that must be highlighted in the development of skills of students and employees both in academic and health organizations.⁽¹³⁾ Nursing students face difficulties in identifying and adopting best practices.⁽¹⁴⁾ during training, they experience difficulty in understanding certain theoretical contents and applying them in practical activities and internships, in such a way as to articulate theory and practice, which requires incorporation of active methodologies in the teaching-learning process.⁽¹⁵⁾

In this aspect, the National Curricular Guidelines (DCN, as per its Portuguese acronym) for the Nursing Course⁽¹⁶⁾ guide generalist, humanist, critical and reflective training. The new DCN⁽¹⁷⁾ reinforce this orientation, in addition to demanding training aligned with the use, development and validation of technologies that improve nursing care practices, in such a way as to allow the training process to create conditions for the student to expand skills in different areas of knowledge that will guide his/her professional practice. Therefore, it is believed that the insertion of virtual teaching technologies, in addition to enabling the exploration of multimedia resources, contributes to improvements in learning the topic in question, since these technologies have promoted new learning environments in educational contexts.⁽¹⁸⁾

Accordingly, the fact of identifying learning needs about patient safety and medication safety during undergraduate studies can represent a fundamental strategy for reducing damage resulting from unsafe practices during this process. Furthermore, considering the force with which virtual educational technologies have entered the academic world in recent years,⁽¹⁹⁾ it is also considered important to recognize within this community strengths for teaching, mediated by them.

Therefore, the objective of this study is to identify the learning needs of nursing students about patient safety and medication safety.

METHODS

Descriptive and cross-sectional study developed with undergraduate nursing students from a higher education institution (HEI) in the Federal public sphere in the state of Piauí, from March 2019 to December 2020.

The non-probabilistic and intentional sample consisted of 45 participants, based on the target population of 305 undergraduate students, identified in the Integrated Academic Activity Management System (SIGAA, as per its Portuguese acronym), through the frequency list made available by the coordination of the nursing course from the aforementioned IES.

The study included undergraduate students linked to the institution with active enrollment; those who had completed the subjects related to Basic Fundamentals of Nursing I and II, taught in the 4th and 5th periods of the course, respectively, where the topic in question is part of the content to be addressed during the development of both subjects already mentioned; and those who expressed availability and agreement to participate in the study by signing the Free and Informed Consent Form (FICF). All those who were away from academic activities due to medical leave during the collection period or who had a history of simultaneous repetition in both subjects were excluded.

After applying the inclusion and exclusion criteria, 78 undergraduate nursing students were invited to participate in the research. Of these, 45 students (25 from the 7th and 20 from the 9th period of the course) agreed to participate in the study. The distribution of participating students between the nine periods of the course was not uniform, given that students from the 1st to 4th periods were excluded for not meeting the requirement to complete the fundamental subjects already mentioned, and students from the 6th and 8th periods were already on academic vacation during the collection period.

The invitation and explanations about the study were made to the undergraduate nursing students on site and collectively, with authorization from the course coordinator for the researcher to enter the classroom. Once this was done, those who agreed to participate in the research were asked to read and sign the FICF. Subsequently, the data collection instrument was completed, whose questions (n=34) were distributed into four domains (I- sociodemographic data; II- internet and computer use; III- institutional strengths and restrictions; and IV- identification of the need for learning about patient safety and medication safety). On average, it took 15 minutes to complete and return the form.

The IV domain of the form was prepared in light of the Patient Safety Curriculum Guide of the World Health Organization – Multidisciplinary Edition ⁽¹²⁾ and the Safety Protocol in the Prescription, Use

and Administration of Medications of the Brazilian Health Surveillance Agency ⁽¹³⁾, with questions related to medication safety, as displayed in the chart below, where the participant would judge the level of importance of the items and his/her need for learning, selecting one of the alternatives, on a scale ranging from 1 to 5. On that scale, the following were considered: 1- as not important, 2-reasonably important, 3-important, 4-very important and 5-essential, according to the relevance of the content of each question, namely:

Box 1. Questions related to the survey of the learning needs of nursing students about patient safety when using medications. Teresina, Piauí, Brazil, 2023.

Patient safety	Safety in medication use
1. Defining the key concepts.	8. Differentiating: side effect, adverse reaction, adverse event, error, adverse medication event, adverse medication reaction and medication error.
2. Understanding the systems and the effect of the complexity of patient care.	9. Improve safety in medication use.
3. Knowing policies and programs focused on patient safety.	10. Knowing the magnitude of medication errors.
4. Learning from errors to avoid damage.	11. Common sources of medication errors
5. Involving patients and caregivers in health care.	12. Errors may occur as part of the medication process: Prescription, dispensing, preparation, administration or monitoring.
6. Importance of the human factor for patient safety.	13. Responsibilities associated with the prescription and administration of medications.
7. Working effectively as part of a team.	14. Recognizing common dangerous situations in the medication administration process.
	15. Ways of making the use of medications safer.
	16. Benefits of a multidisciplinary approach to the safe use of medications.

Source: prepared by the authors (2023).

The obtained data were tabulated and organized in the Microsoft Excel 2016 software and then transferred to the Statistical Package for the Social Sciences (SPSS), version 22.0, performing descriptive statistics to analyze the characteristics of the undergraduate students, as well as calculating the absolute and relative frequencies for quantitative variables, with average and standard deviation.

The study was approved by the Ethics Committee of the Federal University of Piauí, CAAE n.º 21086619.0.0000.5214 and Opinion n.º 5.302.961, after meeting all ethical and legal recommendations for research involving human beings and following the recommendations contained in the verification list of the STROBE initiative. ⁽¹⁴⁾

RESULTS

Among the 45 participants, it was found that 33 (73.3%) were female, with an average age of 23 (± 3.04) years, 42 were single, representing a majority (93.3%), 19 lived with their parents (42.2%), 14 lived with other people without blood and/or marital ties (31.1%) and 25 (55.6%) reported a family income between 1 and 2 minimum wages, as displayed in Table 1.

Table 1. Sociodemographic characterization of undergraduate nursing students from a federal public university in the state of Piauí/Brazil (2019-2020). N=45. Teresina, Piauí, Brazil, 2023.

Variables	(N%)	Average \pm Sd ^t	Min-Max
Gender			
Female	33(73.3)		
Male	12(26.7)		
Age		23 \pm 3.04	17-35
\leq 25 years	41(91.1)		
>25 years	4(8.9)		
Marital Status			
Single	42(93.3)		
Married/Stable	2(4.4)		
Separated/Divorced	1(2.2)		
Family Situation			
Living with parents and siblings	19(42.2)		
Living only with mother and siblings	6(13.3)		
Living with grandparents	3(6.7)		

Living with parents and siblings	
Living only with mother and siblings	14(31.1)
Living with other people without blood and/or marital ties	
Living alone	2(4.4)
Living with husband and children	1(2.2)
Religion	
Catholic	27(60.0)
Evangelical	12(26.7)
Without religion	5(11.1)
Others*	1(2.2)
Family Income	
≤ 1 MW ³	10(22.2)
1- 2 MW	25(55.6)
2- 5 MW	9(20.0)
> 5 MW	1(2.2)

¹SD-Standard Deviation; ²MW-Minimum Wage; ³Others-Umbanda.

Source: prepared by the authors (2023).

Regarding internet use, everyone confirmed having access (n=45; 100%), with a daily frequency of use by 42 (93.3%), with smartphones being the most used devices to access it (n=42; 77.8%) and having the home as the predominant place of access (n=36; 80.0%). Computer use was confirmed at a frequency of 3 to 5 times a week (n=21; 46.7%), with the home environment also being the most frequent place for use (n=37; 82.2%), as displayed in Table 2.

Table 2. Internet access by undergraduate nursing students from a federal public university in the state of Piauí/Brazil (2019-2020). N= 45. Teresina, Piauí, Brazil, 2023.

Variables	(N%)
Internet access	
Yes	45(100.0)
Frequency of internet use	
Daily	42(93.3)
3 to 6 times a week	3(6.7)
Most frequent device	
Smartfones	42(77.8)
Notebook	11(20.4)
Computer	1(1.9)
Predominance of internet access	
Home	36(80.0)
University	9(20.0)
Frequency of computer/notebook use	
3 to 5 times a week	21(46.7)
Daily	20(44.4)
1 to 2 times a week	4(8.9)
Place of device use	
Home	37(82.2)
University	7(15.6)
Workplace	1(2.2)

Source: prepared by the authors (2023).

Regarding “institutional strengths and restrictions” for the provision of education, mediated by virtual technologies, Table 3 shows that 45 (100.0%) participants stated the existence of two computer laboratories and 29 (70.7%) reported the availability of 10 to 30 computers in the laboratories, with access to them confirmed by 23 (51.1%) participants and Wi-Fi coverage by 37 (82.2%) sample members.

Table 3. Characterization of the institutional strengths and restrictions of undergraduate nursing students from a federal public university in the state of Piauí/Brazil (2019-2020). N= 45. Teresina, Piauí, Brazil, 2023.

Variables	(N%)	Average ± Sd ¹	Min-Max
Computer laboratory	45(100.0)		
N° of computer laboratories		2±0.77	1-4
N° of available computers			
10 - 30	29(70.7)		
31 - 60	11(26.8)		
61 - 100	1(2.4)		
Free access to computers			
Yes	23(51.1)		
No	22(48.9)		
Wi-Fi coverage			
Yes	37(82.2)		
No	8(17.8)		

Source: prepared by the authors (2023).

Regarding the survey of learning needs about patient safety and medication safety, Table 4 confirms that both topics obtained the classification “essential” among the alternatives.

Table 4. Characterization of questionnaires relating to the identification of learning needs answered by undergraduate nursing students from a federal public university in the state of Piauí/Brazil. (2019-2020). N=45. Teresina, Piauí, Brazil, 2023.

Question	Not important N (%)	Reasonably important N (%)	Important N (%)	Very important N (%)	Essential N (%)
Patient safety					
01	0(0.0)	0(0.0)	10(22.2)	6(13.3)	29(64.4)
02	0(0.0)	0(0.0)	2(4.4)	12(26.7)	31(68.9)
03	0(0.0)	1(2.3)	2(4.4)	14(31.8)	27(61.4)
04	0(0.0)	1(2.2)	9(20.0)	12(26.7)	23(51.1)
05	0(0.0)	0(0.0)	9(20.0)	11(24.4)	25(55.6)
06	0(0.0)	0(0.0)	5(11.1)	14(31.1)	26(57.8)
07	0(0.0)	0(0.0)	1(2.3)	6(13.6)	37(84.1)
Safety in medication use					
08	1(2.2)	0(0.0)	3(6.7)	8(17.8)	33(73.3)
09	0(0.0)	1(2.2)	1(2.2)	16(35.6)	27(60.0)
10	0(0.0)	0(0.0)	2(4.4)	12(26.7)	31(68.9)
11	0(0.0)	1(2.2)	5(11.1)	15(33.3)	24(53.3)
12	0(0.0)	2(4.4)	5(11.1)	10(22.2)	28(62.2)
13	0(0.0)	1(2.2)	3(6.7)	12(26.7)	29(64.4)
14	1(2.2)	0(0.0)	2(4.4)	9(20.0)	33(73.3)
15	0(0.0)	0(0.0)	5(11.1)	16(35.6)	24(53.3)
16	0(0.0)	0(0.0)	9(20.0)	10(22.2)	26(57.8)

Source: prepared by the authors (2023).

As for the topic “patient safety”, there was a greater expression of learning needs in the subjects of questions 7, 2 and 1, referring to: working effectively as part of a team, understanding the systems and the effect of the complexity of patient care and defining the key concepts, respectively. Regarding the topic related to medication safety, questions 8, 14 and 13 stood out, relating to: Differences between side effects, adverse reaction, adverse event, error, adverse medication event, adverse medication reaction and medication error, recognizing common dangerous situations in the medication administration process and responsibilities associated with the prescription and the administration of medications, respectively.

DISCUSSION

The results of this study showed the need for teaching about patient safety and safety in medication use, mainly in terms of working as part of a team, understanding the complexity of systems, safety concepts, as well as recognizing risk situations and responsibilities inherent to the medication process, which are points that need to be further discussed within the undergraduate course, with a view to guaranteeing qualified and safe patient care by future nurses.

These findings corroborate those of a study carried out with students completing the nursing course in a public higher education institution, which made it possible to highlight knowledge gaps regarding the development of patient safety in their academic training and as nurses.⁽²⁰⁾ In a survey of 638 students, the highest percentage of participants reported they did not achieve formal learning about the topic and revealed a concern about working environment and teamwork appreciation, which are fundamental aspects for a safety culture.⁽²¹⁾

Therefore, when training future nursing professionals, it is essential to develop skills that guarantee the safety of the provided care. However, one cannot ignore the importance of both the process and the structure of health services. After all, the occurrence of adverse events is a complex phenomenon, influenced by multiple factors and causes, and is directly related to failures in the health system. Consequently, it requires a professional and comprehensive approach to ensure excellence in patient care.⁽²²⁾

A study carried out in Rio de Janeiro, with the objective of identifying the knowledge and attitudes of nurses undergoing training regarding patient safety, revealed that, although students have knowledge about the matter in question, they are unable to develop a positive communication attitude toward the error made in the face of the patient and/or his/her family member. Therefore, it can be inferred that, in addition to knowledge, it is imperative to have an attitude that converges with safe care. It is beneficial for academia to create an environment that establishes safety and encourages the socialization of errors and doubts, with a view to adopting both individual and collective changes by the scientific community in this regard.⁽²³⁾

In order for future nurses to internalize the patient safety culture as an inherent part of their professional work, it is essential that such principles fully permeate their academic training. It is only in this way that students will become aware of the importance of recognizing and learning from their failures, enabling them to identify and take action in the face of potential errors, whether made by themselves or witnessed in their professional practice.⁽²¹⁾

In the context of medication processes, the results of this study reveal difficulty unveiled by participants in terms of differentiating side effects, adverse reactions, adverse events, errors, adverse medication events, adverse medication reactions and medication errors, recognizing common dangerous situations in the medication administration process and responsibilities associated with the prescription and the administration of medications, respectively.

The complexity of the duties assigned to the nursing team in terms of administering medications is evident, since this is the last step in the process responsible for avoiding possible harm to the patient.⁽²⁴⁾ Medication administration is a step shared between the nurse and the nursing technician. In several studies, this step of the process is the most susceptible to errors. It is described as the process where there are more records of ME and where nurses are directly involved, as shown in a study held in Chile, 11 (22%) occupy third place.⁽²⁵⁾

A study about teaching patient safety in an undergraduate nursing course from a teaching perspective, carried out in the state of São Paulo, highlights the importance of adopting multiple teaching strategies (demonstration of systems and applications, discussion of articles, case studies, seminars and clinical visits with discussion of cases), as a mechanism for obtaining better results in terms of safety in medication use", and points out forms of evaluation that can be considered (tests, participation in chats, forums, tasks, oral evaluation, presentation of seminars and self-evaluation) during and at the end of teaching. For the author, this range of modality, in addition to supporting the learning process, verifies whether the final objectives and behaviors have been acquired.⁽²⁶⁾

The discussion about patient safety is essential since undergraduate studies. It is imperative to use innovative methodologies that encourage students to acquire critical and reflective thinking, as the Brazilian Ministry of Health has already recognized the importance of this matter since Ordinance 529, dated 2013, which highlights the need to include patient safety in technical, undergraduate and graduate degrees in the area of health. It is essential that health professionals are prepared to ensure the safety and well-being of patients in all situations.⁽²²⁾

In order to fill existing gaps, higher education institutions need to reevaluate their objectives and move away from the traditional approach of acquiring and assimilating knowledge. Conversely, they must create space for interdisciplinary teaching, which allows the integration of theoretical and practical content. This readjustment is crucial, especially when considering the complexity of the phenomenon related to patient safety. It is imperative to encourage the organization of critical thinking and the application of

appropriate practices, in such a way as to guarantee the best possible experience for the patient. As a limitation, it is noteworthy that the study does not allow generalizations, due to the fact that it was developed in a single institution.

The findings of this research are relevant and can contribute to awakening the teachers and students of the academic nursing community in terms of medication safety, as it pointed to the need for teaching about this topic, including the possibility of carrying it out in virtual mode, which is believed to be of great magnitude for the safe medication care that will be provided by future nurses.

CONCLUSION

It was observed that there is a need for teaching about patient safety and medication safety, since participants had difficulty in terms of recognizing concepts, systems, human factors and other mechanisms for promoting patient safety and medication safety. Furthermore, institutional and student strengths were identified for the use of virtual technologies in teaching this topic, given that there is availability of computers and internet access for undergraduate students from the institution in question.

CONTRIBUTIONS

Contributed to the conception or design of the study/research: Figueiredo IGA, Avelino FVSD. Contributed to data collection: Figueiredo IGA. Contributed to the analysis and/or interpretation of data: Figueiredo IGA, Pierot EV, Navarro FJC. Contributed to article writing or critical review: Figueiredo IGA, Pierot EV, Leal BL, Negreiros ALB. Final approval of the version to be published: Avelino FVSD.

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