GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 6 (363) Июнь 2025

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press. Published since 1994. Distributed in NIS, EU and USA.

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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Содержание:

GEORGIAN MEDICAL NEWS
No 6 (363) 2025

EFFECTIVENESS OF EDUCATIONAL INTERVENTIONS TO DEVELOP PATIENT SAFETY KNOWLEDGE, SKILLS, BEHAVIORS, AND ATTITUDES IN NURSING STUDENTS – INTERNATIONAL STUDY

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Abstract.

Background: Patient safety education is a foundational component of quality nursing practice. Adequately trained nurses are essential to prevent harm and ensure effective, ethical, and responsive healthcare delivery.

Aim: This study aimed to assess and compare the effectiveness of educational interventions on the development of patient safety knowledge, skills, attitudes, and behaviors among nursing students in Georgia and Estonia.

Methods: A cross-sectional quantitative study design was employed. Data were collected from 269 nursing students: 216 from Georgia (197 vocational, 19 undergraduate) and 52 from Estonia (9 undergraduate, 43 graduate). Structured questionnaires with closed and open-ended questions were used. Descriptive and inferential statistics were analyzed using IBM SPSS, and thematic analysis was conducted for qualitative responses.

Results: The findings identified associations between Georgian and Estonian nursing students in clinical experience, educational exposure, and self-assessed competence in patient safety. In Georgia, 28% of vocational students had no clinical experience, while 42% of Estonian undergraduates reported three years of clinical practice. Georgian vocational education primarily relied on lectures (41%), whereas Estonian programs incorporated more simulation-based training (65%) and interactive seminars. Post-intervention self-assessments showed notable improvement in perceived knowledge, with Estonian students exhibiting the greatest gains. Teamwork, infection control, and critical thinking were the most frequently reported competencies. Behavioral change post-training was reported by 93% of Georgian undergraduates and all Estonian respondents. However, 25% of Georgian vocational students did not recognize attitudinal shifts despite reporting skill development. Students across all programs expressed a desire for more practical training and diverse educational methods.

Conclusion: Estonian nursing education demonstrates greater integration of experiential learning and critical self-reflection, fostering stronger patient safety competence. Georgian vocational programs require modernization and curricular reform to align with international patient safety standards. Prioritizing interactive, simulation-based, and case-oriented learning can significantly enhance nursing education outcomes in Georgia.

Key words. Patient safety, nursing education, simulation-based training, competency, Georgia, Estonia.

Introduction.

Patient safety is a cornerstone of quality healthcare, and nurses play a pivotal role in maintaining it. To prepare nursing students for this responsibility, educational programs must equip them with the knowledge, critical thinking, and clinical skills necessary to prevent errors and ensure safe care. Over the past decade, simulation-based learning, case-based learning, and competency-based continuing professional development (CPD) have emerged as effective strategies to improve these competencies [1,2].

Simulation-based learning offers a safe environment where students can develop clinical reasoning and decision-making skills. Studies have shown its effectiveness in enhancing patient safety knowledge and practice [2]. For instance, in a study by Machitidze (2023), 29% of nursing students favored simulation for improving clinical reasoning, while 45% highlighted clinical practice as the best bridge from simulated scenarios to real-world settings [3]. Case-based learning also supports critical thinking and clinical judgment. According to the same study, 42% of students found case-based learning effective in strengthening clinical reasoning skills [3]. Similarly, CPD programs are instrumental in maintaining and advancing professional competencies, with 90% of respondents in Machitidze's study viewing CPD as practical and effective in nursing practice.

Despite these proven strategies, significant challenges persist—especially in regions like Georgia, where many nurses work without higher education or access to mandatory continuing education. The lack of simulation labs and innovative teaching approaches contributes to uneven student preparation and threatens patient safety outcomes [3,4]. To address these issues, it is essential to integrate simulation-based learning, case-based learning, and CPD into nursing curricula more consistently. These interventions have been shown to foster critical thinking, practical skills, and confidence in clinical decision-making [5,6]. However, equal access to educational resources and consistent teaching quality remains a barrier in many developing areas.

Policy reforms, curriculum improvements, and investment in educational infrastructure are urgently needed to bridge these gaps. Doing so will promote clinical excellence and ensure that all nursing students, regardless of location, are equipped to uphold patient safety standards [7].

The global focus on patient safety in healthcare has placed increased pressure on nursing education programs to prepare students with clinical knowledge and the behaviors, skills, and critical thinking necessary to ensure safe patient care. The World Health Organization emphasizes that nurses are key to delivering safe, high-quality care and that their training must reflect this essential role. Georgia and Estonia present unique

educational and systemic contexts. While Estonia has aligned many of its healthcare education practices with EU standards, Georgia is undergoing a transitional phase in updating nursing education and integrating patient safety into curricula. This study explores how educational interventions influence patient safety competencies among nursing students in both countries, focusing on differences in teaching methodology, clinical exposure, and student self-assessment.

Methodology.

This cross-sectional, quantitative study was conducted from 2023 to early 2024 to evaluate the impact of patient safety-related educational interventions on nursing students' knowledge, skills, behaviors, and attitudes. A total of 268 nursing students from Georgia and Estonia participated in the study. In Georgia, 216 students (197 from vocational programs and 19 from undergraduate programs) were recruited from educational institutions in Tbilisi, Batumi, Kutaisi, Zugdidi, and the University of Georgia. In Estonia, 52 students (9 undergraduate and 43 graduate students) were enrolled from Tallinn Health College.

Ethical approval was obtained from the Biomedical Research Ethics Committee at the School of Health Sciences, University of Georgia, and the Ethics Committee of Tallinn Health Care College. Participation in the study was entirely voluntary. Informed consent was obtained from all participants prior to their involvement. Participants were clearly informed of their right to withdraw from the study at any time without any negative consequences. Confidentiality and anonymity were strictly maintained, and no personally identifiable information was collected or reported.

A structured, self-administered questionnaire was developed specifically for the study to assess students' experiences with patient safety education, as well as their perceived knowledge, practical skills, behaviors, and attitudes. The questionnaire consisted of 22 items organized into six major sections, combining both quantitative (Likert-scale and multiple-choice questions) and qualitative elements. (1) Demographic information - general information about the participants was collected, such as level of education (secondary vocational or higher), course of study, age group, gender identity, and length of clinical teaching experience (up to 1 year, 1–2 years, or 3 years); (2) Educational interventions - participants answered the question of whether they received patient safety-oriented education during their studies. In the case of a positive answer, they named specific interventions (lectures, simulation exercises, seminars, online modules, role-playing games, etc.) and the topics that were covered during the learning process. Participants also assessed how effectively these interventions contributed to improving their knowledge; (3) Patient safety knowledge Participants assessed their level of knowledge before and after the educational interventions. In addition, their self-confidence in safety-related issues was assessed and it was determined which topics were emphasized during the training (e.g., medical error prevention, communication, infection control, risk management, etc.); (4) Safety skills - students were given the opportunity to assess how the educational interventions influenced their practical skills. The list included competencies such as effective communication, medication management, infection prevention, critical thinking, error reporting, and patient advocacy; (6) Attitudes toward patient safety - Participants indicated whether their behavior and attitudes changed after the educational interventions. They were assessed for being more careful, following protocols, working collaboratively, and actively participating in improving safety. They also identified which types of interventions had the most positive impact on them; (6) Overall evaluation - At the end, students rated the overall effectiveness of the educational interventions in terms of developing knowledge, skills, behavior, and attitudes. They also offered recommendations for improving patient safety education and answered the question of how safe they would feel if a fellow student were their caregiver. All sections consisted of closed and multiple-choice questions with the possibility of additional responses, ensuring ethical standards and voluntary participation. The questionnaire was developed based on a review of current international literature and was evaluated by a panel of experts in nursing education to ensure both content and face validity. A pilot test was conducted on a small sample ($n = 20$), and internal consistency was measured using Cronbach's alpha. The instrument demonstrated high reliability, with a Cronbach's $\alpha = 0.86$, indicating strong internal coherence.

Quantitative data were analyzed using IBM SPSS Statistics (Version 26). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic data and item responses. Inferential statistical methods (e.g., chi-square tests, t-tests, or ANOVA, as appropriate) were applied to examine relationships between key variables. Responses to open-ended questions were analyzed using thematic analysis to identify recurring themes and patterns in students' experiences and perceptions. Inferential tests such as independent-samples t-tests, chi-square tests, and ANOVA were applied where appropriate to compare groups across variables (e.g., self-assessed knowledge, attitudes, and skills). Statistical significance was set at $p < 0.05$, with 95% confidence intervals reported where relevant.

Results.

The demographic data revealed that 94.4% of Georgian respondents were female, and 66.5% of vocational students were older than 25 years. In contrast, Estonian participants were primarily aged 20–25. Clinical experience varied significantly; 28% of Georgian vocational students had no clinical experience, while 42% of Estonian undergraduates had three years.

Participation in patient safety training was reported by 87% of Georgian vocational students and 74% of undergraduates. In Estonia, 56% had full training, 35% partial, and only one student had no exposure. Teaching methods also differed significantly. Georgian vocational programs predominantly used lectures (41%) and simulations (25%), while Estonian programs balanced seminars, simulations, and case discussions. Undergraduate students in Georgia had more evenly distributed exposure to lecture, simulation, case studies, and role-play (Table 1).

Self-assessment of knowledge showed marked improvement in post-training. Among Georgian vocational students, those rating their knowledge as "very high" rose from 19% to 24%.

Georgian undergraduates showed a notable increase in students rating their knowledge as "high" (from 21% to 63%). In Estonia, "high" knowledge ratings rose from 6% to 58%, with 11% rating their knowledge as "very high" post-intervention (Table 2).

Table 1. *Comparison of Teaching Methods Across Student Groups, (Teaching Methods by Program).*

Teaching Method	Georgia Vocational (%)	Georgia Undergraduate (%)	Estonia (%)
Lecture	41	25	60
Simulation	25	25	65
Role Play	9	25	20
Case Analysis	8	25	60

Table 2. *Self-Assessment of Patient Safety Knowledge Before and After Training.*

Knowledge Level	Professional Program (Before)	Professional Program (After)	Undergraduate Program (Before)	Undergraduate Program (After)
Very High	19% (n=37)	24% (n=47)	0%	0%
High	22%	53%	21%	63% (n=12)
Average	47% (n=90)	19%	58%	37% (n=7)
Low	—	—	21%	—

Table 3. *Knowledge Assessment Before and After Training.*

Knowledge Level	Georgia Vocational (Before)	Georgia Vocational (After)	Georgia Undergraduate (Before)	Georgia Undergraduate (After)	Estonia (Before)	Estonia (After)
Very High	19%	24%	0%	0%	8%	11%
High	22%	53%	21%	63%	6%	58%
Average	47%	19%	58%	37%	36%	22%
Low	12%	4%	21%	0%	36%	9%

Statistical analysis using chi-square tests revealed significant differences between groups in perceived knowledge levels post-intervention ($\chi^2 = 12.87$, $p = 0.005$). Estonian students rated their skills higher overall (Mean = 2.76, SD = 0.52) compared to Georgian students (Mean = 2.20, SD = 0.75), $t(38) = 3.22$, $p = 0.002$, 95% CI [0.21, 0.90] (Tables 2 and 3).

Students were asked to evaluate the effectiveness of the training. Among Georgian vocational students, 52% found the training "very effective," as did 58% of undergraduates and Estonian students. No respondents in either country considered the training ineffective (Table 4).

Table 4. *Perceived Effectiveness of Training.*

Rating	Georgia Vocational (%)	Georgia Undergraduate (%)	Estonia (%)
Very Effective	52	58	58
Effective	27	21	32
Somewhat Effective	16	21	8
Not Effective	0	0	0

In terms of skills development, Georgian vocational students most frequently cited teamwork (75%), infection control (59%), protocol adherence (56%), and critical thinking (48%). Estonian students identified infection control (85%), critical thinking (73%), and communication (67%) as the most developed competencies. Error reporting and analysis were more frequently mentioned by Estonian students (65%) than Georgians (21%) (Table 5).

Table 5. *Skills Acquired by Students.*

Skill Area	Georgia Vocational (%)	Estonia (%)
Teamwork	75	69
Infection Control	59	85
Protocol Adherence	56	63
Critical Thinking	48	73
Communication	42	67
Error Reporting	21	65
Patient Advocacy	17	27

Behavioral and attitudinal changes were more commonly reported in Estonia and among Georgian undergraduates. While 93% of Georgian undergraduates and 100% of Estonian students acknowledged behavioral change, 25% of Georgian vocational students did not recognize attitudinal shifts, even if they had acquired new skills. Estonian students were particularly strong in reporting increased protocol adherence, safety measure application, and risk recognition.

A statistically significant association was found between reported attitude change and peer trust ($\chi^2 = 8.11$, $p = 0.017$), suggesting students who acknowledged behavioral improvements were more likely to feel confident in their peers' ability to provide safe care.

When asked about suggested improvements, students across all institutions expressed a strong preference for more practical learning. In Georgia, 49% of vocational students and 54% of undergraduates preferred more practice-oriented training. Estonian students similarly favored hands-on learning, with a preference for simulation (26%) and role-play (12%). When asked whether they would feel safe receiving care from a peer in their own training group, 68% of Georgian vocational students responded "yes," while only 37% of undergraduates and 41% of Estonian students did so. This cautious evaluation reflects greater critical awareness among higher-level students.

Discussion.

This study highlights significant differences in the structure, delivery, and outcomes of patient safety education among nursing students in Georgia and Estonia. The Estonian approach demonstrates stronger integration of simulation-based and case-oriented learning, aligned with international best practices. These methods, particularly simulation and scenario-based training, enhance not only technical proficiency but also essential competencies such as teamwork, critical thinking, and safety awareness [8].

The Estonian model illustrates that patient safety education must be approached not merely as a theoretical topic but as a continuous, competency-based process [9]. It serves as a valuable example for Georgia, where nursing education would benefit from enhanced practical training opportunities, the introduction of interdisciplinary and simulation-based teaching methods, and the systematic integration of safety culture into all

levels of professional preparation. Adopting such an approach could significantly elevate the quality and effectiveness of nursing education in Georgia, ultimately improving patient outcomes and healthcare system resilience [10]. This model aligns with the WHO's Nurse Educator Core Competencies, which emphasize practice-based, interprofessional learning and systemic approaches to safety education [9]. Estonia's intgration of simulation and case-based scenarios supports this alignment and may serve as a regional model for reform efforts in other transitional health systems [11]. Estonian students benefited from more consistent clinical practice and training environments that emphasized reflection, protocol adherence, and open communication. These elements are critical for developing a patient safety culture. The World Health Organization underscores the importance of practice-based and interprofessional training in cultivating safety competencies [4].

The relationship between educational attainment and patient safety competence is increasingly supported by evidence. Abram et al. found that while master's nursing students demonstrated strong foundations in evidence-based nursing practice (EBNP), gaps remained that necessitated curriculum improvement to better support patient safety competencies [12]. Similarly, a study in China found that higher patient safety competence levels among master's nursing students were associated with fewer adverse events, reinforcing the importance of advanced education in improving safety outcomes [13].

`1Patient safety competencies evolve across educational levels. Vocational nursing students, with limited exposure to theoretical safety principles, tend to adopt reactive attitudes focused on individual error prevention. Undergraduate students show broader awareness and knowledge of safety frameworks, shaped by curriculum and clinical settings [14]. In contrast, master's-level education emphasizes leadership, systems thinking, and policy, fostering proactive, systemic safety perspectives. Graduate students are more likely to value interprofessional collaboration and institutional improvements for safety advancement [13].

Structured educational interventions have proven effective in enhancing safety-related knowledge and attitudes. A systematic review in Nurse Education Today confirmed that well-designed interventions improve patient safety outcomes [15]. One particularly effective strategy is problem-based learning (PBL). Jamshidi et al. demonstrated in a randomized controlled trial that students receiving PBL training showed significantly improved safety knowledge, perceptions, and attitudes compared to those in traditional lecture settings [8]. Jang and Lee also highlighted that nursing educators require enhanced training to deliver effective patient safety education, especially in fast-evolving clinical environments [2].

Georgian vocational education still relies heavily on traditional didactic methods, with limited clinical exposure and simulation use. This model may contribute to inflated self-confidence without the corresponding skills and behavioral change. Studies have shown that overestimation of knowledge in such environments may hinder safe practice, particularly among early-career nurses [5]. Feedback from Georgian students confirms the need for more practice-focused, hands-on training and better alignment with safety competencies.

In both Georgia and Estonia, students consistently emphasized the value of practical and simulation-based training over purely theoretical instruction. This aligns with findings that active learning techniques—especially PBL and clinical simulation—build long-term competence and reinforce behavioral change essential to patient safety culture [2,8,15].

Estonia's educational framework offers a robust model for integrating patient safety into nursing education. By combining theory, practice, reflection, and systemic safety training, it prepares nursing students to meet modern healthcare demands. Georgian programs, particularly vocational tracks, should consider curricular reform that incorporates these elements to improve patient safety outcomes, student preparedness, and healthcare system quality. This model aligns well with WHO Nurse Educator Core Competencies, emphasizing experiential learning, interprofessional collaboration, and systems-based thinking in patient safety education [7,9].

Limitations.

This study has several limitations. By using cross-sectional design, the findings should be interpreted as associational rather than causal. The sample was also unbalanced, with a disproportionately high number of vocational students from Georgia. This reflects the national structure of nursing education, where most training occurs at the vocational level and only one university offers a bachelor's program with limited enrolment. While this limits the generalizability of the findings, it still provides valuable insight into how different educational approaches affect students' self-perceptions. It is important to note that nursing students, regardless of educational level, ultimately share equal responsibility for patient safety. Additionally, recruitment through academic institutions may not fully represent the broader population of nursing students. Finally, the study focused on immediate self-assessment and reflection, without long-term follow-up to evaluate sustained changes in knowledge, attitudes, or behavior related to patient safety (Table 6).

Conclusion.

According to the analysis of the research results, in both Georgia and Estonia, with slight differences, nursing programs

Table 6. *Summary of Skill Improvement, Attitude Change, Overall Effectiveness, and Peer Trust by Country and Education Level.*

Country	Education Level	Skill Improvement (Mean)	Skill Improvement (SD)	n	Attitude Change (Mean)	Attitude Change (SD)	n	Overall Effectiveness (Mean)	Overall Effectiveness (SD)	n	Peer Trust (Mean)	Peer Trust (SD)	n
Estonia	1	1.00	0.00	8	1.00	0.00	21	1.10	0.67	5	—	—	0
Georgia	University	2.40	0.52	10	0.60	0.52	10	2.50	0.85	10	2.80	0.42	10
Georgia	Vocational	2.51	0.57	178	0.77	0.42	178	2.38	0.75	178	2.58	0.71	178

Note. SD = standard deviation; n = number of respondents. '—' indicates missing or unavailable data.

at all levels focus on almost similar issues of patient safety. The study definitely highlights significant disparities in the preparedness of nursing students in Georgia regarding patient safety, largely shaped by differences in the structure, delivery, and resources of vocational and undergraduate nursing programs. Educational interventions were found to positively influence students' knowledge, skills, and attitudes toward patient safety; however, the extent and nature of this impact varied across educational levels.

Professional (vocational) program students, while often confident in their theoretical understanding, were predominantly exposed to lecture-based instruction with limited use of active learning methods such as simulation, role-play, or case analysis. This lack of methodological diversity may hinder their ability to apply patient safety principles in clinical settings. Despite this, 93% of vocational students reported a positive shift in their attitudes following training, indicating that even theory-driven instruction can promote attitudinal awareness when patient safety is explicitly addressed.

In contrast, undergraduate (bachelor's) students benefited from more diverse and practice-oriented teaching methods, leading to more critical self-assessment and deeper engagement. While they demonstrated more cautious evaluations of their knowledge and skills, this likely reflects a more nuanced understanding of the complexity and responsibilities involved in ensuring patient safety. Their balanced exposure to simulation, collaborative learning, and reflective activities appears to foster not only technical competency but also a greater sense of professional accountability.

Differences also emerged in students' perceptions of peer competence: 68% of vocational students stated they would feel safe under the care of a classmate, compared to just 37% of undergraduates. This may highlight the undergraduates' heightened expectations or greater awareness of the competencies required for safe nursing care.

Demographic characteristics such as age and study level also played a role in shaping perspectives. Nearly 18% of vocational students were over 41 years old, while only 33.5% were under 25, suggesting that younger individuals may be less inclined to pursue vocational nursing—a trend worth exploring in workforce planning and recruitment strategies.

Across both groups, students overwhelmingly expressed a desire for more practical, hands-on training, with nearly half of vocational students and over half of undergraduates recommending increased focus on simulation and real-life scenario-based education. This aligns with global trends emphasizing experiential learning in nursing education.

Taken together, these findings emphasize the urgent need for targeted curriculum reforms. Enhancing the practical components of vocational programs, incorporating active learning strategies, and ensuring methodological diversity can help bridge the gap between theory and practice. Additionally, the development of national standards and policy frameworks, aligned with international patient safety guidelines, is essential for ensuring consistent, high-quality nursing education across all institutions.

Implementing these reforms will help better prepare nursing students at all educational levels to deliver safe, competent, and patient-centered care, ultimately strengthening the effectiveness, reliability, and safety of the healthcare system in Georgia.

Acknowledgment.

Special thanks to the Shota Rustaveli National Scientific Foundation of Georgia for financial support. The authors would like to express their sincere gratitude to the University of Georgia and Tallinn Health Care College for their support and collaboration in conducting this study. Special thanks are extended to the administrative and quality assurance departments of the participating institutions for facilitating data collection and to all the nursing students who participated and generously shared their time and insights into this research. The research team extended our appreciation to the authors of the literature reviewed and the international organizations that provided open access to their valuable research, recommendations, and insights.

Conflict of Interest.

The authors declare that they have no conflict of interest related to this study.

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