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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

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საქართველოს სამედიცინო სიახლენი

**GEORGIAN MEDICAL NEWS**

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**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:*

# ASSESSING GEORGIAN NURSES' KNOWLEDGE AND ATTITUDES ON SAFE MEDICATION ADMINISTRATION: GAPS AND COMPLIANCE CHALLENGES

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## Abstract.

**Aim of study:** Ensuring the safe administration of medications is a critical component of effective clinical care and patient recovery. Healthcare professionals' educational backgrounds significantly influence patient safety by fostering analytical thinking and sound clinical judgment. In Georgia, while most hospital nurses hold professional-level qualifications, the absence of mandatory licensing and continuing education raises concerns about sustained competency. This study examines the knowledge and attitudes of Georgian hospital nurses toward safe medication administration to identify gaps and inform safety-enhancing interventions.

**Methodology:** A cross-sectional quantitative study used stratified random sampling [SRS] to ensure regional representation. The required sample size was calculated with a 95% confidence interval [CI], 5% margin of error [ME], and a 50% response distribution [RD]. Based on an estimated population of ~22,000 hospital nurses in Georgia, the minimum sample size was 378. The final sample size was increased to 400 to mitigate potential non-response or incomplete data. Data was collected via a self-administered questionnaire containing closed- and open-ended items. Knowledge and attitudes toward medication safety were analyzed by gender, age, education level, and employment location [capital vs. regional hospitals] using validated measurement scales [VMS].

**Results:** The findings revealed that 78% of nurses demonstrated basic knowledge of medication safety, only 52% were familiar with high-alert medications, and just 46% routinely double-checked dosages. Regarding attitudes, 64% acknowledged the importance of safe administration, yet 39% reported feeling time-constrained, impacting adherence to protocols. Additionally, 33% indicated a lack of institutional support or standardized guidelines. These results point to significant gaps in knowledge and practice.

**Conclusion:** The findings highlight the need for standardized training and national safety protocols to reduce risks and improve medication safety in Georgian hospitals. Targeted educational interventions are essential to support safer, more effective care.

**Key words.** Patient safety, medication safety, nursing education.

## Introduction.

The patient is central to the health sector, with safe care, improved health, and high-quality medical services as priorities. The WHO emphasizes meeting patients' needs through fair, effective, timely, and integrated health services. The "do no harm" principle underlines that no patient should be harmed while receiving care. A health system must consistently implement measures to reduce risks, prevent errors, and mitigate harm if errors occur [1]. Patient safety, integral to clinical medicine, focuses on preventing errors and harm to ensure well-being and maintain trust in healthcare systems. Its effectiveness depends on integrating education and clinical practice to enhance patient care and improve treatment approaches, ultimately promoting population health and safety. By combining these areas, healthcare systems achieve better outcomes and improved quality of care.

Patient safety is a global healthcare priority, leading to goals and initiatives to reduce preventable harm. WHO's 2021 goals include minimizing medication errors, preventing healthcare-associated infections, and improving provider communication. National and international organizations have also launched patient safety initiatives. The Institute for Healthcare Improvement [IHI] advocates for a "triple aim" focusing on patient awareness, population health, and cost reduction. The National Patient Safety Foundation [NPSF] emphasizes safety culture, transparency, and learning from mistakes [2]. Error reporting and analysis and root cause analysis identify systemic weaknesses to prevent recurrence. A patient safety culture promotes learning over blame, fostering an environment where professionals can acknowledge and correct errors. For instance, the UK's Safe Patients Initiative reduced hospital-acquired infections and adverse drug events by improving care processes [3]. A 2008 heparin overdose incident in a US hospital underscores the importance of clear labeling and double-checking to prevent similar errors [4].

Ensuring patient safety builds trust in healthcare systems, encouraging patients to seek medical care and fostering effective patient-provider relationships. Safety must be central to all healthcare aspects, ensuring patient well-being and treatment efficacy. Medical errors, failures to perform planned actions, or wrong approaches to achieving goals are categorized into execution and planning errors. Execution errors occur during implementation while planning errors result from incorrect treatment strategies. Risks to patient treatment include clinical risks like medication errors, surgical complications, and diagnostic inaccuracies; inefficiencies in hospital processes; staffing inadequacies; poor communication; environmental factors; and human errors, often linked to fatigue or lack of training [5]. Globally, one in ten patients is harmed during care, with over three million deaths annually due to poor care. In low- and middle-income countries, four in 100 patients die from unsafe care [6]. The WHO's 2023 report identifies common causes of patient harm, including medication errors, unsafe surgeries, nosocomial infections, and diagnostic errors, estimating the global economic cost of harm at $1 trillion annually.

Medication administration errors are a leading cause of patient harm. Ensuring safe care involves identifying errors related to patients, timing, procedures, and medication administration; educating patients on medication rules; reducing fall risks; and monitoring health status. According to WHO's 2020 data, Georgia has 647.4 doctors per 100,000 people, surpassing European and CIS averages. Despite this, Georgia faces a critical nursing shortage, with 595.3 nurses per 100,000 population. The low popularity of nursing, limited development opportunities, and inadequate remuneration contribute to a nurse-to-doctor ratio of 0.9, compared to 2-2.7 in the EU. The disparity highlights the urgent need for more nurses in Georgia's healthcare system [7-9]. The safety of clinical processes, including medication administration, is crucial for patient care and recovery. Medical personnel's education is vital, with high-level education fostering analytical thinking and appropriate attitudes. In Georgia, most hospital nurses have professional education. Assessing their knowledge and attitudes according to education levels strengthens the relevance of research on medication safety. Georgia lacks statistical data on nursing errors despite an increase in hospitals per 100,000 people from 4.9 in 2012 to 7.1 in 2021, exceeding the EU average of 2.9. Hospitals are concentrated in the capital and regional centers, exacerbating workforce shortages and affecting service standards [1,10]. According to 2023 data, Georgia has 15.4 thousand hospital beds served by 21.5 thousand nurses and 24.4 thousand doctors.

Studies confirm that nursing qualifications impact medical care quality, though no such studies exist in Georgia. By generalizing international experiences and published research, it is evident that Georgia is under-researched on this topic. This study, the first of its kind in Georgia, has scientific and practical value. Assessing nurses' knowledge and attitudes toward medication safety will identify practices, errors, and knowledge gaps, enabling targeted interventions. Analysis of physician responses will contribute to recommendations for promoting multidisciplinary teamwork. These efforts will enhance patient safety and improve treatment and recovery outcomes.

## Methodology.

This study employed a quantitative cross-sectional design to simultaneously assess nurses' knowledge and attitudes regarding medication safety practices. Data were collected across 15 hospitals and medical centers in Georgia to ensure broad geographic representation, including facilities in the capital city, Tbilisi, and major regional cities. Ethical approval was granted by the Biomedical Research Ethics Committee of the School of Health Sciences, University of Georgia [study code: UGREC-39-23, N-11-33882]. Participation was voluntary, with informed consent obtained from all respondents. Participants were informed of their right to withdraw at any point, and measures were taken to ensure confidentiality and anonymity, with no personally identifiable information collected. The study population comprised hospital-based nurses [n = 400]. The required sample size was calculated using an estimated total population of approximately 22,000 nurses in Georgia, assuming a 95% confidence interval [CI], a 5% margin of error, and a 50% response rate. The minimum sample size was estimated to be 378, which was increased to 400 to account for possible non-response or incomplete data. A multimodal sampling strategy incorporated cluster, stratified, simple random, and systematic sampling techniques. Stratified random sampling was applied to ensure regional representation, and efforts were made to sample comparable medical departments across institutions. Inclusion criteria included employment at one of the selected hospitals and at least six months of work experience.

Data were collected using a structured questionnaire developed in accordance with WHO and ICN patient safety guidelines and adapted to the Georgian clinical setting. The tool included 35 questions: 25 closed-ended, 8 Likert-scale, and two open-ended questions covering five domains: demographics, education/training, knowledge/practices, attitudes, and challenges. Closed-ended and Likert-scale items assessed key aspects of medication safety, such as patient identification, medication selection, dosage, timing, administration route, documentation, patient education, and adverse event management. Open-ended questions explored systemic and contextual barriers. The questionnaire was administered in both digital and printed formats. Hospital administrators sent nurses the electronic version via Google Forms. Quantitative data were analyzed using IBM SPSS Statistics [version 27]. Descriptive statistics, including frequency distributions and cross-tabulations, were used to summarize the responses. Inferential statistics, such as chi-square tests and risk assessments, were used to explore relationships between demographic variables [e.g., gender, age, education, and work experience] and nurses' knowledge and attitudes. Binary logistic regression analysis was conducted to further examine factors associated with non-adherence to safe medication administration practices. Odds ratios [ORs] and p-values were calculated to identify significant predictors of non-compliance, including variables such as age group, geographic location, educational attainment, and years of clinical experience. Reliability tests and confidence intervals were used to validate the consistency and precision of the quantitative findings. Thematic analysis was applied to responses from open-ended questions to identify recurring patterns and contextual insights.

## Results.

According to the study design, 400 nurses working in hospitals across Tbilisi and various regions and municipalities of Georgia participated in the study. To ensure the generalizability of findings, respondents were strategically grouped into three main geographic zones: Tbilisi—168 nurses [42.0%], Western Georgia—126 nurses [31.5%], and Eastern Georgia—106 nurses [26.5%]. This classification enabled a balanced analysis of regional differences in healthcare service delivery, workforce demographics, and patient needs. A marked gender imbalance was observed, with 380 participants [95.0%] identifying as female and 20 participants [5.0%] as male. While official national data on gender distribution among nurses in Georgia were unavailable, the study still permits a descriptive statistical overview of both male and female respondents. The participants' ages ranged from 20 to 63 and were categorized into the

following groups: 20–24 years, 24 nurses [6.0%]; 25–50 years, 273 nurses [68.3%]; and 51–64 years, 103 nurses [25.8%]. This categorization supports age-based comparisons in knowledge and attitudes regarding medication safety (Table 1).

***Table 1.*** *Demographic Characteristics of Nurse Respondents (N = 400).*

| Variable | Category | Frequency [n] | Percentage [%] |
|---|---|---|---|
| Variable | Category | Frequency [n] | Percentage [%] |
| Region | Tbilisi | 168 | 42.0 |
| | Western Georgia | 126 | 31.5 |
| | Eastern Georgia | 106 | 26.5 |
| Gender | Female | 380 | 95.0 |
| | Male | 20 | 5.0 |
| Age Group [years] | 20–24 | 24 | 6.0 |
| | 25–50 | 273 | 68.3 |
| | 51–64 | 103 | 25.8 |

Regarding educational background, 294 nurses [73.5%] held professional nursing education, 66 [16.5%] had higher nursing education, 38 [9.5%] completed a graduate medical program, and 5 [1.3%] held a master's degree. In terms of patient safety education, 357 nurses [89.3%] reported receiving formal instruction, 7 [1.8%] said they had not, and 36 [9.0%] could not recall. Accounting for the latter group, around 11.0% of nurses lack usable knowledge of patient safety post-graduation. In total, 355 nurses [88.8%] reported receiving professional training; 34 [8.5%] had not, and 11 [2.8%] could not recall. Training frequency varied: 215 nurses [53.8%] received training systematically, 98 [24.5%] every 6 months, 61 [15.3%] every 1–3 years, and 26 [6.5%] only once every 5 years (Table 2).

***Table 2.*** *Education and Training of Nurse Respondents by Region (N = 400).*

| Category | Tbilisi (n = 168) | Western Georgia (n = 126) | Eastern Georgia (n = 106) | Total (n = 400) |
|---|---|---|---|---|
| **Education Level** | | | | |
| Professional nursing education | 124 | 95 | 75 | 294 |
| Higher nursing education | 28 | 18 | 20 | 66 |
| Graduate medical program | 13 | 11 | 14 | 38 |
| Master's degree | 3 | 2 | 0 | 5 |
| **Patient Safety Education** | | | | |
| Received | 150 | 112 | 95 | 357 |
| Did not receive | 2 | 3 | 2 | 7 |
| Do not remember | 16 | 11 | 9 | 36 |
| **Professional Training (General Topics)** | | | | |
| Received | 149 | 112 | 94 | 355 |
| Did not receive | 13 | 10 | 11 | 34 |
| Do not remember | 6 | 4 | 1 | 11 |
| **Training Frequency** | | | | |
| Systematic training | 95 | 70 | 50 | 215 |
| Every 6 months | 40 | 30 | 28 | 98 |
| Every 1–3 years | 25 | 18 | 18 | 61 |
| Every 5 years | 8 | 8 | 10 | 26 |

During respondents nursing careers, a significant number of respondents reported awareness or involvement in medication administration errors. Specifically, 234 nurses (58.5%) had heard of such errors in general, while 34 (8.4%) indicated that a nurse in their own department had committed a medication error. Additionally, 13 respondents (3.2%) admitted to having made a medication error themselves. Thirty-seven nurses (9.2%) recalled an incident occurring in their own clinic, and 317 (79.3%) had heard of errors happening in other healthcare facilities. Taken together, approximately 20.8% of the reported cases were directly linked to the respondents' own clinical environment, underscoring the relevance and visibility of medication errors within local practice settings (Table 3).

***Table 3.*** *Experience with Medication Errors.*

| Response | Frequency [n] | Percentage [%] |
|---|---|---|
| Heard of a medication error in general | 234 | 58.5 |
| A nurse in their department committed a medication error | 34 | 8.4 |
| Personally, committed a medication error | 13 | 3.2 |
| A medication error occurred in their own clinic | 37 | 9.2 |
| Heard of a medication error in another clinic | 317 | 79.3 |

Adherence to core safety practices was generally high. 344 nurses [86.0%] "always" verified patient identity, 354 [88.5%] consistently checked medication labels and administration route, and 351 [87.8%] always documented medication administration. However, only 225 nurses [56.3%] reported being informed of the patient's diagnosis before administering medication (Table 4).

***Table 4.*** *Adherence to Medication Safety Practices.*

| Practice | Frequency [n] | Percentage [%] |
|---|---|---|
| Always check patient identity | 344 | 86.0 |
| Often check patient identity | 20 | 5.0 |
| Never check patient identity | 10 | 2.5 |
| Always check medication labels | 354 | 88.5 |
| Sometimes/often check labels | 46 | 11.5 |
| Always check route of administration | 354 | 88.5 |
| Often check route | 23 | 5.8 |
| Always document medication | 351 | 87.8 |
| Often/sometimes document | 49 | 12.3 |
| Aware of patient diagnosis before administration | 225 | 56.3 |

When asked how safe they would feel as a patient in their own clinic, 321 respondents [80.3%] reported feeling safe, 47 [11.8%] said "probably," and 24 [6.0%] were undecided indicating nearly 20% lack full confidence in institutional safety standards. Primary barriers to safe medication administration included lack of knowledge and education – 94 nurses [23.5%], high workload – 67 [16.8%], poor nurse-physician communication – 64 [16.1%], and physician errors – 47 [11.7%].

Logistic regression analysis identified significant predictors of non-adherence to safe medication practices [Table 4]. Nurses aged 20–24 had 1.4 times higher odds (OR = 1.4) of non-adherence compared to those aged 25–50. Those working in Tbilisi had 2.3 times higher odds (OR = 2.3; p = 0.006) of non-compliance than regional nurses. Nurses with professional education were 2.4 times more likely (OR = 2.4; p = 0.032) to not adhere to safe practices compared to those with higher education. Interestingly, nurses with ≥6 years of experience showed 2.3 times higher odds (OR = 2.3; p = 0.019) of non-adherence than those with ≤5 years (Table 5).

***Table 5.*** *Odds Ratios for Non-Adherence to Safe Medication Practices.*

| Variable | Odds Ratio (OR) | p-value |
|---|---|---|
| Age group: 20–24 vs. 25–50 | 1.4 | – |
| Region: Tbilisi vs. Regions | 2.3 | 0.006 |
| Education: Professional vs. Higher | 2.4 | 0.032 |
| Experience: ≥6 yrs vs. ≤5 yrs | 2.3 | 0.019 |

Finally, the perceptions of safety by the department varied considerably. 100% of nurses in laboratory, hematology, and obstetrics departments felt safe. However, only 57.6% in emergencies, 25.0% in oncology, and 76.2% in surgery, anesthesia, and resuscitation departments reported feeling safe as patients in their own institutions. These discrepancies highlight the need for department-specific safety improvements.

## Discussion.

The role of nurses in the healthcare sector is undoubtedly essential. Their responsibilities include a wide range of tasks that ensure the well-being of patients. Nursing education is directly related to patient safety, the prevention of medical errors, and the promotion of positive patient outcomes.

Integrating evidence-based practice into nursing education and clinical settings is essential for improving patient safety. Evidence-based practice involves the application of the best available research evidence, clinical expertise, and patient-centered care. This approach reduces the likelihood of errors and enhances care quality by ensuring clinical decisions are grounded in the most current and reliable information [11]. Patients hold medical [competence, appropriate treatment, appropriate medication administration] and non-medical [courtesy, compassion and kindness, caring, emotional stability, balance, fairness] expectations of nurses. Compassion fosters trust between patients and nurses, reinforcing the critical role of nursing education in developing these professional attributes [12]. Nurses' knowledge and attitude toward patient safety play an important role in creating a safe patient environment, providing quality medical care, and preventing medical/nursing errors. Among healthcare workers, nurses have a unique role in patient safety, as they are most often in direct contact with the patient and, therefore, play an important role in the treatment/care process. Raising awareness of patient safety among nurses, deepening their education level, and changing attitudes toward patients are necessary to ensure patient safety [12].

The results revealed notable regional disparities in adherence to safe medication administration practices. Nurses in Tbilisi had 2.3 times higher odds of non-adherence than those in regional areas. Several factors may explain this disparity. Urban hospitals often face higher patient volumes, staff shortages, and more complex workflows, which may reduce the time available for medication checks and communication. Additionally, institutional culture and the consistency of ongoing education may vary significantly across regions, with some rural facilities potentially offering more stable or supportive environments for clinical compliance.

A more unexpected finding was the inverse association between years of experience and adherence to safety protocols. Nurses with six or more years of experience had 2.3 times higher odds of non-adherence than those with five years or less. This paradox challenges the common assumption that experience inherently improves performance. Potential explanations include complacency, overreliance on routine, or outdated knowledge due to insufficient continuing education. In contrast, less experienced nurses, likely more recently trained and closely supervised—may adhere more strictly to protocols. This finding highlights the urgent need to implement structured refresher training programs for experienced nurses and to reinforce accountability at all stages of a nursing career. Nurses with higher education, such as a bachelor's or master's degree, demonstrate stronger critical thinking skills and are more likely to engage in evidence-based practice. Higher education programs expose students to broader theoretical frameworks and emphasize clinical reasoning. While experience is essential for competence, it must be paired with continuous professional development. This study shows that education alone is insufficient; ongoing, practice-oriented training is equally critical for reinforcing safe medication practices.

Nurses with higher education, such as those with a bachelor's or master's degree, demonstrate more critical thinking skills. Because higher education programs cover a broader range of concepts, theories, and evidence-based practices, they foster critical thinking. Of course, when it comes to critical thinking and competency, experience is essential; encouraging the development of critical thinking skills in nurses is undoubtedly essential for safe nursing practice, but it is not the only skill that student nurses need to develop during their studies. Inexperience and a lack of practical clinical training are also recognized as major contributors to medication errors among healthcare providers. Many nursing students and newly graduated nurses report that their academic programs do not fully prepare them for the complexities of real-world medication administration [13-15]. According to a study by Treiber and Jones, 55% of nursing graduates had committed at least one medication error. They emphasized the need for more hands-on practice in diverse clinical settings and more intensive pharmacological training as key areas for educational improvement [13].

Clear, standardized guidelines for medication administration and consistent access to training are essential for error prevention. Ongoing education on error prevention is crucial for maintaining clinical competence [16]. In addition, clinical reasoning and critical reflection are vital tools that help nurses assess patient conditions, make safe decisions, and adapt to new evidence. These skills allow nurses to understand how to follow procedures and why they are essential in different patient contexts. With continued clinical exposure, nurses develop the ability to evaluate complex situations and make well-informed decisions. Experience complements formal education and, when combined with updated knowledge, enhances nurses' ability to apply clinical judgment effectively [12].

The study also revealed that only 56.3% of respondents reported being informed of a patient's diagnosis before administering medication. This finding underscores a disconnection between procedural compliance and contextual understanding. Even when protocols are followed, incomplete clinical information can compromise safety, emphasizing the need for improved interdisciplinary communication.

It is undeniable that continued education, clinical competence, and critical thinking not only enhance nurses' knowledge of safe medication administration but also help shape their attitudes toward safety, including the importance of timely documentation and error reporting. Ensuring positive patient outcomes through clinical excellence is not just a professional duty—it reflects a nurse's commitment to helping individuals achieve optimal health and well-being [17-18].

Basic nursing education forms the foundation of clinical competence; however, competency-based continuing professional education is equally vital. It ensures that nurses remain current with technological advances, clinical guidelines, and best practices. Collaboration between academic institutions and healthcare organizations can improve education and patient outcomes by aligning teaching methods with real-world clinical needs [17].

## Conclusion.

This study shows how important it is for nurses to keep learning and getting better at giving out medicine safely. It also points out that in Georgia, like in other places around the world, nursing is mostly done by women. This means that we need to make sure that nurses get the right training to give out medicine safely. When nurses have more education and keep learning, they are better at giving out medicine safely. The study also found that some nurses don't have as many chances to keep learning, especially in places where people don't need urgent care. This can lead to differences in how safe nurses are when giving out medicine. To fix this, hospitals and other healthcare places should have training programs that cover everything nurses need to know, both in theory and in practice. This will help nurses be better at their jobs, make fewer mistakes with medicine, and keep patients safe.

In the future, more research should look at how continuing education affects how safe nurses are with medicine. It should also look at how hospitals can make sure that all nurses have the same chances to keep learning. And we should study how working with other healthcare workers and using technology to learn can make giving out medicine safer and improve how well patients are taken care of.

This study highlights essential insights into healthcare personnel's knowledge, attitudes, and practices regarding medication safety in Georgia. A key limitation of this study is the need for national statistics on nursing errors, including medication administration errors. This absence of baseline data restricted the ability to compare the study's findings with broader national trends, potentially limiting the generalizability of the results.

Given these limitations, future research should prioritize establishing a national database to systematically track and analyze nursing errors, particularly medication administration errors. Such data would offer critical insights into error prevalence and trends, enabling more comprehensive and targeted interventions.

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## Conflict of Interest.

The authors declare no conflict of interest. The confidentiality of all respondents has been rigorously safeguarded, ensuring their privacy throughout the research process. Furthermore, the study adheres to ethical standards by maintaining the integrity of referenced literature, preserving source accuracy, and avoiding any distortion of information. No financial interests or external funding were involved in conducting this research. The authors involved in the process of working on the article acknowledge the work of each of them—the work done by the authors and the authenticity of the original research manuscript.

## REFERENCES

1. World Health Organization. Patient safety fact file. 2019. https://www.who.int/news-room/fact-sheets/detail/patient-safety

2. Institute for Healthcare Improvement. The IHI triple aim. 2025. https://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

3. Benning A, Dixon-Woods M, Nwulu U, et al. Multiple component patient safety intervention in English hospitals: controlled evaluation of second phase. BMJ BMJ. 2011;342:d199.

4. Smetzer JL, Cohen MR. Chapter 19. Medication error reporting systems. In: Cohen MR, editor. Medication errors. 2nd ed. Washington, DC: The American Pharmacists Association; 2007.

5. Reason J. Human error: models and management. BMJ. 2000;320:768-770.

6. Organisation for Economic Co-operation and Development [OECD]. Health working papers on the economics of patient safety. 2022. https://one.oecd.org/document/DELSA/HEA/WD/HWP[2022]13/en/pdf

7. World Health Organization. European health for all family of databases [HFA-DB]. 2024. https://who-sandbox.squiz.cloud/en/data-and-evidence/databases/european-health-for-all-family-of-databases-hfa-db
8. National Statistical Service of Georgia. Statistical data on healthcare. 2024. https://www.geostat.ge/ka/modules/categories/54/jandatsva
9. National Center for Disease Control and Public Health. Statistical handbook. 2021. https://test.ncdc.ge/Pages/User/News.aspx?ID=fad4aa1f-2eab-4792-bf4d-5792f58c1782
10. National Center for Disease Control and Public Health. Statistical handbook. 2019. https://test.ncdc.ge/Pages/User/News.aspx?ID=fad4aa1f-2eab-4792-bf4d-5792f58c1782
11. Melnyk BM, Fineout-Overholt E. Evidence-based practice in nursing & healthcare: a guide to best practice. 4th ed. Philadelphia: Wolters Kluwer; 2019.
12. Machitidze M. Assessment of nurses' education and attitudes toward patient safe medication administration in Georgia. Am J Biomed Sci Res. 2023;20:210-216.
13. Treiber LA, Jones JH. After the medication error: recent nursing graduates' reflections on adequacy of education. J Nurs Educ. 2018;57:275-280.
14. Escrivá Gracia J, Brage Serrano R, Fernández Garrido J. Medication errors and drug knowledge gaps among critical-care nurses: a mixed multi-method study. BMC Health Serv Res. 2019;19:640.
15. Teal T, Emory J, Patton S. Analysis of medication errors and near misses made by nursing students. Int J Nurs Educ Scholarsh. 2019;16.
16. Márquez-Hernández VV, Fuentes-Colmenero AL, Cañadas-Núñez F, et al. Factors related to medication errors in the preparation and administration of intravenous medication in the hospital environment. PLoS One. 2019;14:e0220001.
17. Cutilli CC. Excellence in patient education: evidence-based education that "sticks" and improves patient outcomes. Nurs Clin North Am. 2020;55:267-282.
18. Jardien-Baboo S, Van Rooyen D, Ricks E. Perceptions of patient-centered care at public hospitals in Nelson Mandela Bay. Health SA Gesondheid. 2016;21:397-405.