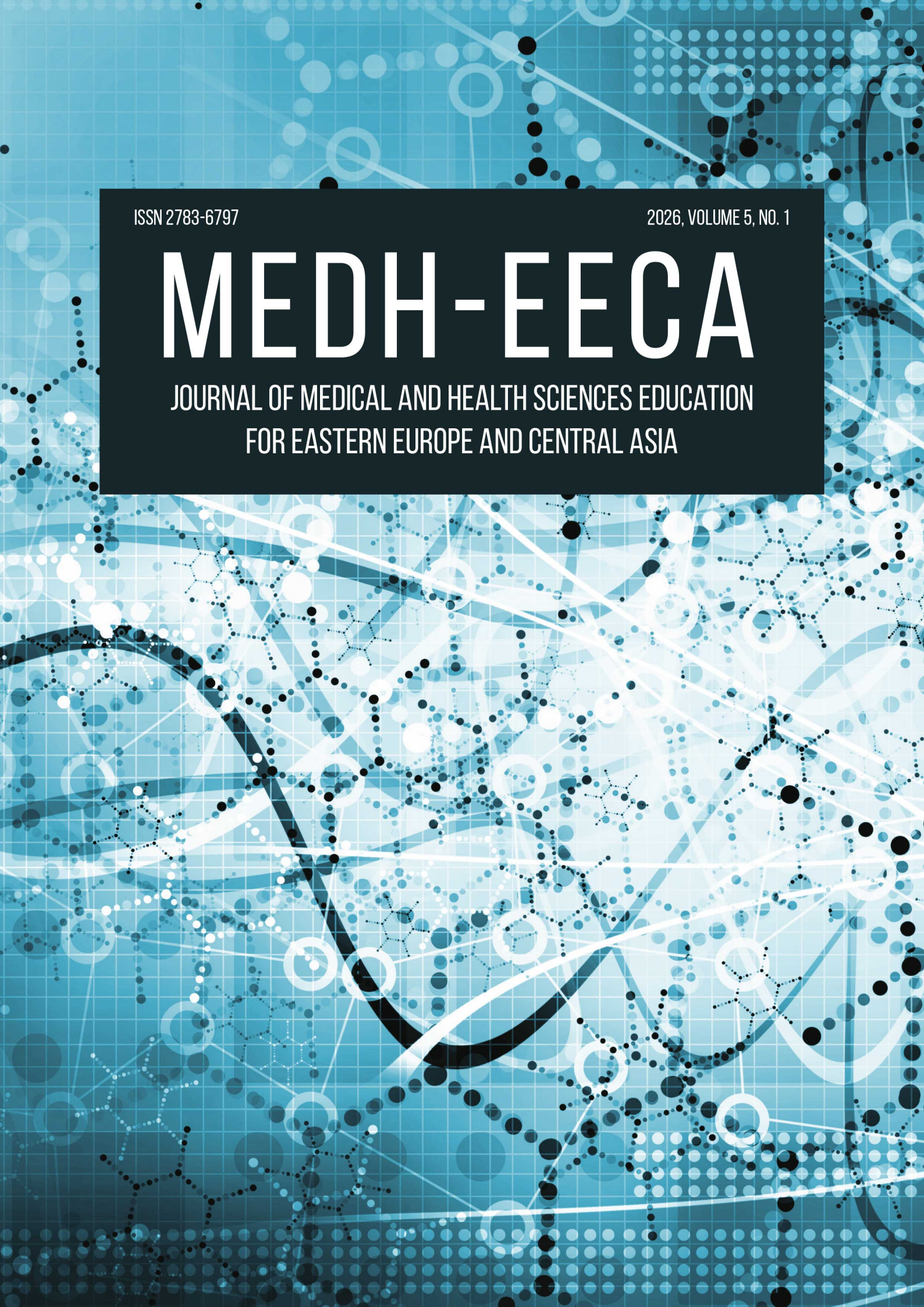
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# MEDH-EECA

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The purpose of the MED-EECA is to advance knowledge and disseminate research findings that are directly relevant to the practice of health science education, including multiple fields of medical, public health, nursing, and pharmaceutical training. The journal publishes scholarly papers on all aspects of health science education including: peer review evaluation and case studies; institutional accreditation and training programme accreditation related materials; the theory, practice and policies relating to management, improvement of quality in medical and other health sciences education; new initiatives and models in learning and teaching that impact on quality and standards; links between quality assurance and employability of healthcare staff; evaluation of the impact of quality procedures at national level; theoretical and practical analyses of quality and quality initiatives in health science training; comparative studies between institutions or countries, etc. In particular, the journal specifically aims to become a platform available for Eastern European and Central Asian countries to share the new ideas and demonstrate rapid and significant advancements in reforming the training of human resourses for healthcare.

Original articles with scientific investigations and systematic literature reviews are welcomed from professionals of other health related fields on issues that have a direct impact on the area of staff training and strengthen evidence-based practice. Letters to the editor with commentaries on published papers or research and clinical issues, as well as short communications, will be taken into consideration and not left unanswered. This journal also provides space for announcements and an international calendar for professional conferences in the area of training of healthcare professionals.

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# EDITORIAL

## BEYOND THE TECHNOLOGY: A HUMAN-CENTRED APPROACH TO VIRTUAL REALITY APPLICATIONS IN HEALTH PROFESSIONS EDUCATION

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Healthcare education is increasingly characterised by a growing diversity of learning methods supported by advanced technologies. High-fidelity simulation (HFS), virtual reality (VR), augmented reality (AR), and extended reality (XR) are becoming increasingly visible in the education of nurses, physicians, midwives, and other healthcare professionals. These technologies provide opportunities to reproduce complex clinical situations in safe and controlled environments, allowing students to practise clinical reasoning, decision-making, communication, teamwork, and technical skills before encountering similar situations with real patients. The growing body of evidence, particularly in nursing education, suggests that VR-based education can improve several learning outcomes, including knowledge, skills, self-efficacy, competence, and learning satisfaction. Recent systematic reviews and meta-analyses have reported positive effects of VR-based education on nursing students' knowledge, skill performance, and self-efficacy, although effects on clinical reasoning, communication, motivation, and other outcomes remain less consistent [1–4].

At the same time, the evidence is becoming more nuanced. Immersive technology should not automatically be considered synonymous with better learning. Recent reviews have identified considerable heterogeneity in study designs, learning outcomes, levels of immersion, and learner populations, while some studies report mixed or inconclusive results [1,5]. Importantly, the technology itself may introduce an additional layer of complexity into the learning process. Head-mounted VR can cause cybersickness and discomfort, including dizziness, nausea, headache, visual disturbances, disorientation, and eye fatigue. A recent systematic review identified oculomotor disturbances and disorientation among the most frequently reported adverse effects, although their intensity and occurrence varied considerably between studies [6]. These issues should not be regarded simply as technical inconveniences. For some learners, physical discomfort, unfamiliarity with the equipment, or the additional cognitive effort required to interact with a virtual environment may become competing demands during learning.

This raises an important question for health professions education: Are we evaluating only what students learn from technology, or are we also evaluating what the technology itself adds to the learning experience? Not all students will respond to immersive technologies in the same way. Individual differences in previous experience, digital competence, tolerance of immersive environments, and susceptibility to discomfort need to be considered. Attention may also be required for learners who may be more susceptible to discomfort or adverse effects associated with immersive visual environments. Importantly, such conditions should not automatically be interpreted as absolute contraindications; rather, they highlight the need for appropriate screening, information, safe design, and individualised approaches [6,7]. Thus, the question of technology use in healthcare education is not unambiguously positive or negative. Its educational value depends on how, when, for whom, and for what educational purpose it is implemented.

This perspective is particularly relevant to the VirtualHealEd project (no. S-MIP-24-132),

which was initiated in 2024 through collaboration between the Lithuanian University of Health Sciences (LSMU), Kaunas University of Technology, the HealthEduCom Lab at the University of Oulu, and Lapland University of Applied Sciences, with funding from the Lithuanian Research Council (LMTLT). The project follows a human-centred approach to XR and aims to develop and evaluate an XR-based educational model for healthcare students. Rather than considering technology as an isolated educational intervention, the project integrates human, pedagogical, and technological elements and applies a co-design approach. This is particularly important because the success of an immersive learning environment depends not only on the technical quality of the system, but also on its alignment with learners' needs, educational objectives, and clinical realities.

Within the VirtualHealEd project, two VR-based clinical scenarios were explored with nursing, medical, and midwifery students: management of a patient experiencing anaphylactic shock and discharge education for a patient with bronchial asthma, including instruction on the use of a salbutamol inhaler. The scenarios addressed both acute clinical decision-making and communication-focused competencies such as patient education and supporting self-management. Student feedback was generally positive and highlighted the value of practising clinical situations in a safe environment, testing existing knowledge and skills, and experiencing situations that may be difficult to reproduce in conventional teaching. Several students described the simulations as realistic, engaging, and useful for identifying areas in which they needed to improve, while others valued the opportunity to make mistakes without consequences for a real patient. At the same time, their comments clearly identified the limitations of the technology. Students reported difficulties with controller use, headset comfort, blurred or interrupted images, system failures, overlapping voices, and difficulties understanding some AI-generated speech. Some students also described dizziness, headache, or additional stress during the simulation. Importantly, several students reported feeling more confident and less stressed during subsequent sessions because the VR environment and equipment had become more familiar. This feedback suggests that the learner's experience is shaped not only by the clinical scenario itself, but also by the usability, reliability, and familiarity of the technology. It also shows that some of the challenges identified in the literature are directly relevant to real educational settings.

The conceptual framework proposed by Mikkonen et al. (2025) provides a useful perspective for understanding how such technologies may be integrated into health professions education [8]. The framework combines three educational modalities: classroom-based learning, high-fidelity simulation, and AI-enhanced XR simulation. Rather than replacing one method with another, it proposes a sequential and multidimensional learning process in which theoretical knowledge is followed by experiential learning in HFS and subsequently by adaptive XR scenarios. Such an approach is particularly relevant for interprofessional education because the target is not only the acquisition of clinical knowledge, but also the development of critical thinking, decision-making, collaboration, communication, stress management, and digital competences. Our experience with VirtualHealEd supports this broader view: the value of XR may lie not in replacing existing educational methods, but in providing an additional learning environment in which students can apply and test knowledge in situations that require active decision-making and communication.

At the same time, student feedback reminds us that the technology itself becomes part of the learning environment. Students described difficulties with controllers, remembering which buttons to press, headset positioning, image quality, and simultaneous sounds or voices. Some reported that they needed time simply to understand what was happening in the virtual environment. These observations are important because, during an immersive simulation, students are expected to concentrate on the patient, interpret clinical information, communicate, make

decisions, and perform the required actions. If attention is also directed towards operating the equipment or overcoming technical problems, part of the available cognitive capacity may be used for managing the technology rather than the clinical task. Therefore, technological preparation should be considered as part of simulation design rather than as an independent technical issue. At the same time, the students' comments suggest that familiarity itself may reduce this burden. Several students reported feeling calmer during repeated sessions, indicating that even brief previous exposure to the equipment may influence the learning experience.

This observation raises an important question: should students always receive separate training or instruction before participating in an XR simulation? Our experience suggests that the answer is not straightforward. In our study, additional preparation before the simulation did not show a clear or universal benefit. One possible explanation is the educational level of the participants. Nursing students were mainly in the third or fourth year of their studies, while medical students were in the fourth or fifth year, and therefore already possessed substantial professional knowledge and experience with clinical learning. Some students even commented that basic clinical content repeated during the simulation was already familiar to them and that they would have preferred more complex or programme-specific situations. These comments suggest that preparation should not automatically mean additional teaching of clinical content. Instead, the more relevant question may be what kind of preparation is needed, for whom, and for what purpose: preparation for the clinical scenario, preparation for the technology, or a short orientation combining both.

This distinction is particularly important because the students' feedback showed that technological familiarisation may have a different role from content preparation. Several students suggested practising with the controllers before the simulation, while others reported that they felt more comfortable during subsequent sessions simply because the VR equipment was no longer unfamiliar. At the same time, some students experienced stress or uncertainty at the beginning of the simulation, even when they knew the clinical content. Therefore, a short and targeted technological orientation may sometimes be more useful than extensive pre-simulation teaching. For novice learners or when unfamiliar equipment is introduced, more preparation may be appropriate. Future research should therefore investigate not only whether preparation is beneficial, but for whom, for what purpose, and at what level of intensity.

The VirtualHealEd experience also supports a broader shift from technology-centred to learner-centred development of educational innovations. Co-creation involving educators, healthcare professionals, IT specialists, and students is particularly important because students can identify practical problems that may not be apparent during technical development or curriculum planning. In our project, student feedback provided specific information about the need for better image quality, clearer audio, more realistic dialogue, improved controller usability, appropriate timing, and, in some cases, more opportunities to perform physical actions rather than only select or verbally describe them. Students also commented on the realism of the scenarios and identified situations in which the virtual interaction did not fully correspond to real clinical communication. Such feedback is valuable not only for improving the technical system but also for refining the educational scenario itself. Recent qualitative evidence in nursing and midwifery education similarly highlights the importance of learners' and educators' experiences, well-being, and perceptions when implementing VR-based education, and supports the value of co-design approaches [7].

Finally, the future of VR and XR in healthcare education should not be determined simply by the availability of increasingly sophisticated technology. Human-centred XR, AI-supported virtual patients, wearable sensors, and learning analytics create new opportunities to understand and personalise learning. Within VirtualHealEd, physiological

signals such as EEG, ECG, and PPG are being explored together with speech, performance, and other learning data to better understand stress and cognitive workload during immersive clinical scenarios. Such approaches may help us move beyond asking whether students like VR and towards a more detailed understanding of how different technological environments influence attention, stress, cognitive workload, and performance. Importantly, the student feedback already shows why this broader perspective is needed: a simulation can be perceived as highly engaging and useful while, at the same time, causing technical difficulties, discomfort, or additional stress.

Before VR or XR becomes routinely integrated into health professions curricula, its educational value should therefore be demonstrated through rigorous research and continuous evaluation. Student feedback, learner wellbeing, technological usability, learning outcomes, and transfer to clinical practice should all be considered. Importantly, students should not be viewed only as participants who evaluate a finished technology; their experiences should inform scenario development from the beginning. Technology should complement rather than replace established educational approaches, and its integration should be driven by educational objectives rather than by the novelty of the technology itself. A human-centred, evidence-informed, and co-created approach may ultimately be more important than the level of immersion itself. The key question is therefore not simply how advanced the technology can become, but whether we understand what students need in order to learn effectively within it.

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# USE AND PERCEPTION OF ARTIFICIAL INTELLIGENCE TOOLS AT *NICOLAE TESTEMITANU* STATE UNIVERSITY OF MEDICINE AND PHARMACY OF THE REPUBLIC OF MOLDOVA

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**ABSTRACT. Background.** Growing evidence on the application in education the artificial intelligence (AI) tools indicate that generative AI has become embedded in the daily routines of medical students across diverse settings. **Aim.** To characterise the use, attitudes and training needs concerning generative artificial intelligence (AI) tools across the academic community of a single Eastern European medical university, to inform institutional policy and curriculum development. **Methods.** An anonymous bilingual online questionnaire was distributed to students, medical residents, teaching staff and administrative personnel of *Nicolae Testemitanu* State University of Medicine and Pharmacy (USMF), Chișinău, between March and April 2026. Responses were analysed descriptively; ordinal items were summarised using equally spaced numerical anchors. **Results.** A total of 653 respondents participated (508 students/residents, 120 teaching staff, 25 administrative staff) in the survey. AI use was reported by 98.6% of students, 100% of teachers and 96.0% of administrative staff. ChatGPT was the dominant tool across all groups (90.6%, 85.8% and 88.0%, respectively). Free versions of AI were used exclusively by 79.3% of students. Daily users reported: 24.2% of students, 15.0% of teachers and 20.0% of administrative staff. According to opinion of students, 70.5% agreed that AI improves access to information and 48.2% supported mandatory AI use in education. Among teachers, 70.0% noted scientific accuracy as advantage and 61.7% identified plagiarism as concerns and barrier; only 14.2% agreed that the University provides sufficient AI resources or policies. **Conclusions.** Generative AI tools are routinely used across the USMF community but in the absence of coordinated institutional guidance. The data support the development of an institution-wide AI use-and-disclosure policy, the integration of AI literacy into the medical and pharmaceutical curriculum, and the provision of structured training for teaching and administrative staff.

**Keywords:** artificial intelligence, medical education, opinion of students and staff, application policy.

## Introduction

The public release of ChatGPT by OpenAI in November 2022 marked an inflection point in the diffusion of generative artificial intelligence (AI) into everyday academic life. Within two months of launch, the chatbot had attracted an estimated 100 million users, making it one of the fastest-adopted consumer applications in history, and it was rapidly followed by competing large language models (LLMs) such as Google Gemini, Anthropic Claude, Microsoft Copilot, and Meta LLaMA

[1, 2]. Higher education was among the first sectors to feel this disruption, and medicine, which is a discipline characterised by dense knowledge content, high-stakes assessment and the constant translation of evidence into clinical action, has proven especially fertile ground for adoption [2, 3]. Early studies showing that ChatGPT could perform at or near the passing threshold of all three steps of the United States Medical Licensing Examination (USMLE) without specialised training crystallised both the promise and the trouble generated by the technology and stimulated an unprecedented wave of empirical research on its educational uses [4, 5].

A growing body of cross-sectional surveys now indicates that generative AI has become embedded in the daily routines of medical learners across diverse settings. In the United States, Ganjavi *et al*. found that 96% of medical students surveyed across at least 28 schools were aware of ChatGPT and 52% had already used it for coursework within months of release [6]. Subsequent studies in the United Arab Emirates, Thailand, Germany, Egypt, Saudi Arabia and the People's Republic of China have reported usage prevalences ranging from roughly 49% to 85%, with concentrated use during examination periods and particularly high uptake among preclinical students [7–11]. Reported applications cluster around a recognisable set of educational tasks: explanation and simplification of complex concepts, summarisation of textbook chapters and journal articles, generation of practice questions, support for clinical reasoning and differential diagnosis exercises, language editing of academic writing, and drafting of literature reviews [3,6,12]. Systematic and scoping reviews converge on the conclusion that LLMs can plausibly support personalised, on-demand learning, simulate clinical vignettes and reduce barriers for non-native English speakers, but they also caution that the supporting evidence base for educational outcomes is still nascent and dominated by descriptive rather than experimental designs [3, 12, 13].

The opportunities afforded by AI must be weighed against a well-documented set of risks. The most prominent technical concern is the phenomenon of "hallucination". In medical contexts, where errors may translate into patient harm, hallucinations are particularly hazardous because coherent narrative structure can mask inaccuracy and disarm critical appraisal [14]. A second tier of concerns relates to academic integrity: LLM-generated text often evades both human reviewers and automated plagiarism detectors, and the reliability of dedicated AI-text classifiers remains modest, prompting widespread debate about authorship, assessment design and the redefinition of originality in scholarly work [16, 17]. Additional barriers identified in the literature include unequal access associated with the divide between free and paid tiers of leading models, data-privacy and confidentiality risks when clinical or patient information is entered into commercial platforms, the propagation of bias from training data, and the longer-term possibility of cognitive deskilling if learners outsource reasoning tasks to AI [3, 12, 18, 19].

These tensions have placed medical schools in an unusually difficult position. Faculty and students across multiple jurisdictions report that they are operating in a policy vacuum: a 2025 descriptive survey of United States osteopathic medical schools found that only a minority had formal generative-AI policies in place, and a needs-analysis study of a US allopathic school documented substantial gaps between students' enthusiastic, daily use of AI and faculty members' comfort with its integration [20, 21]. Similar findings have been reported from Saudi Arabia and Germany, where teaching staff describe scientific inaccuracy, plagiarism and lack of formal training as the principal barriers to safe pedagogical adoption [10, 11, 22]. In response, the World Health Organization (WHO) issued ethics-and-governance guidance on large multi-modal models for health in 2024, the Association of American Medical Colleges (AAMC) has published Principles for the Responsible Use of AI in Medical Education and is developing AI competencies across the learning continuum, and several authors have proposed AI-literacy frameworks struc-

tured around foundational, practical, ethical and clinical-application domains [18, 23–25]. There is broad consensus that medical curricula should equip graduates not only to use AI tools competently but also to evaluate their outputs critically, recognise their limitations and apply them within appropriate ethical and regulatory boundaries [13, 24, 25]. Translating this consensus into institution-level practice, however, remains a substantial challenge, particularly where data on local use-patterns, attitudes and training needs are lacking.

Most of the empirical evidence informing this debate originates from medical schools in North America, Western Europe, the Middle East, and East and Southeast Asia. Comparable data from Eastern European, Romanian-speaking and post-Soviet medical-education contexts remain sparse. A handful of regional studies, including a multi-country survey of student AI literacy across Slovakia, Poland, the Czech Republic, Lithuania and Ukraine, and a Romanian cross-sectional analysis of medical students' acceptance of AI- and extended-reality-enabled telemedicine, have begun to describe attitudes and readiness, but these analyses do not focus specifically on generative AI use in medical curricula and explicitly note the paucity of evidence from Central and Eastern Europe [26, 27]. Importantly, large multinational student surveys have repeatedly reported that respondents from Eastern European countries, including the Republic of Moldova, are among those least likely to describe formal AI content within their curriculum [28]. To our knowledge, no peer-reviewed study has yet characterised generative-AI use, perceptions and training needs among the academic community of any medical or pharmaceutical university in the Republic of Moldova.

*Nicolae Testemitanu* State University of Medicine and Pharmacy (USMF) is the only public higher-education institution in the Republic of Moldova authorised to train physicians, dentists and pharmacists. Founded in 1945, USMF currently educates more than 7,000 undergraduate students, residents and doctoral candidates, including approximately 1,700 international students from over 32 countries [29]. The University is therefore singularly positioned at the centre of Moldova's medical workforce pipeline, and decisions taken at USMF regarding AI policy, curriculum and faculty development are likely to shape the digital competencies of the country's clinicians and pharmacists for years to come. As elsewhere, anecdotal evidence suggests that students, teachers and administrative staff at USMF are already engaging extensively with generative AI tools, but this engagement has so far occurred without empirical data to guide policy.

The present study was designed to address this evidence gap. We conducted an institution-wide cross-sectional survey at USMF with the objective of characterising the current state of AI use, attitudes, perceived benefits and risks, and training needs across the three principal academic constituencies: students and medical residents, teaching staff and administrative personnel.

To our knowledge, this is the first study to systematically assess the use and perception of generative artificial intelligence tools across the academic community of the *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova, providing rare empirical data from an underrepresented Eastern European context.

**Methods**

The single-centre, cross-sectional, web-based survey was conducted at USMF, Chisinau, Republic of Moldova. Data were collected over a 41-day period, between March 2026 and April 2026. The survey was open to three eligible academic constituencies: 1) undergraduate students and medical residents enrolled in postgraduate training; 2) teaching staff of any academic rank, including university assistants, associate professors, full professors and researchers with teaching duties; and 3) administrative personnel involved in the operational and academic-support activities of the University. Participation was voluntary and unincentivized. Convenience sampling was used: the survey link was disseminated through institutional email lists, departmental coordinators and student representative channels. There

were no *a priori* inclusion or exclusion criteria beyond active institutional affiliation.

The questionnaire was developed by the research team after a non-systematic review of comparable instruments published in the international literature on AI use in medical education [6, 10, 11, 21, 22], and was adapted to local linguistic and institutional context. The instrument was bilingual (Romanian and English) and was structured into a common section followed by three role-specific branches automatically routed by the respondent's self-reported role at the first item of the survey.

Responses were anonymous. Participants could review and modify their answers prior to submission. The estimated completion time was 7–10 minutes. The study was conducted in accordance with the principles of the Declaration of Helsinki. Participation was anonymous and entirely voluntary; informed consent was obtained electronically through an introductory page that described the study's purpose, the absence of identifying data, the voluntary nature of participation, the right to withdraw and the academic use intended for the aggregated results. As the study did not collect personal or sensitive data and posed no foreseeable risk to participants, formal ethics-committee review was not sought, in accordance with institutional norms for educational quality-improvement surveys.

Analyses were exclusively descriptive. Categorical variables were summarised as frequencies and percentages within each respondent group. Multi-select items were decomposed into per-option proportions, with each option treated as an independent binary variable; the denominator for each option was the total number of respondents in the relevant group. Ordinal Likert-type items were summarised using both response distributions and means computed from equally spaced numerical anchors (0–4 for five-point scales). Open-ended free-text answers and ambiguous responses were classified into the closest pre-defined category by consensus of two reviewers and reported as "Other" where no match was possible. Given the descriptive intent of the study, no inferential hypothesis testing was performed and no adjustment for multiple comparisons was applied. Data management and analysis were performed in Python 3.12.

## Results

**Sample characteristics.** A total of 653 valid responses were received over the survey period. Of these, 508 (77.8%) were submitted by students or medical residents, 120 (18.4%) by teaching staff and 25 (3.8%) by administrative personnel. Detailed sample characteristics are presented in Table 1.

**Table 1.** Sample characteristics by the respondent group

| Characteristic | Students/residents (n = 508) | Teaching staff (n = 120) | Admin (n = 25) |
|---|---|---|---|
| Year of study (students) | | | |
| Year 1 | 176 (34.6%) | – | – |
| Year 2 | 74 (14.6%) | – | – |
| Year 3 | 68 (13.4%) | – | – |
| Year 4 | 73 (14.4%) | – | – |
| Year 5 | 50 (9.8%) | – | – |
| Year 6 | 51 (10.0%) | – | – |
| Residency | 16 (3.1%) | – | – |

**Table 1.** Continued

| Characteristic | Students/residents (n = 508) | Teaching staff (n = 120) | Admin (n = 25) |
|---|---|---|---|
| Faculty (students) | | | |
| Medicine No. 1 | 414 (81.5%) | – | – |
| Pharmacy | 72 (14.2%) | – | – |
| Medicine No. 2 | 13 (2.6%) | – | – |
| Other / Stomatology | 9 (1.8%) | – | – |
| Academic title (teachers) | | | |
| University assistant | – | 55 (45.8%) | – |
| Associate professor | – | 52 (43.3%) | – |
| Full professor | – | 8 (6.7%) | – |
| Researcher / other | – | 5 (4.2%) | – |
| Age (teachers + admin) | | | |
| <30 years | – | 4 (3.3%) | 1 (4.0%) |
| 30–39 years | – | 35 (29.2%) | 7 (28.0%) |
| 40–49 years | – | 36 (30.0%) | 9 (36.0%) |
| 50–59 years | – | 28 (23.3%) | 6 (24.0%) |
| ≥60 years | – | 17 (14.2%) | 2 (8.0%) |

**AI tool adoption and preferred models.** AI tools were near-universally adopted across the institution. Only 7 of 508 students (1.4%) reported never using AI; among teaching staff, no respondent reported never using AI; and among administrative personnel, 1 of 25 (4.0%) reported no use. ChatGPT was the dominant tool in every group, used by 460 of 508 students (90.6%), 103 of 120 teachers (85.8%) and 22 of 25 administrative respondents (88.0%). Google Gemini formed a clear second tier (55.5% of students, 40.0% of teachers, 56.0% of administrative staff). Domain-specific medical AI tools (AMBOSS AI, OpenEvidence, NotebookLM) were notably more common among teaching staff (24.2%) than among students (15.7%) or administrative personnel (4.0%). All other tools surveyed (DeepSeek, Microsoft Copilot/Bing Chat, Anthropic Claude, Meta AI/LLaMA) were used by less than 18% of any group. Detailed proportions are shown in Figure 1.

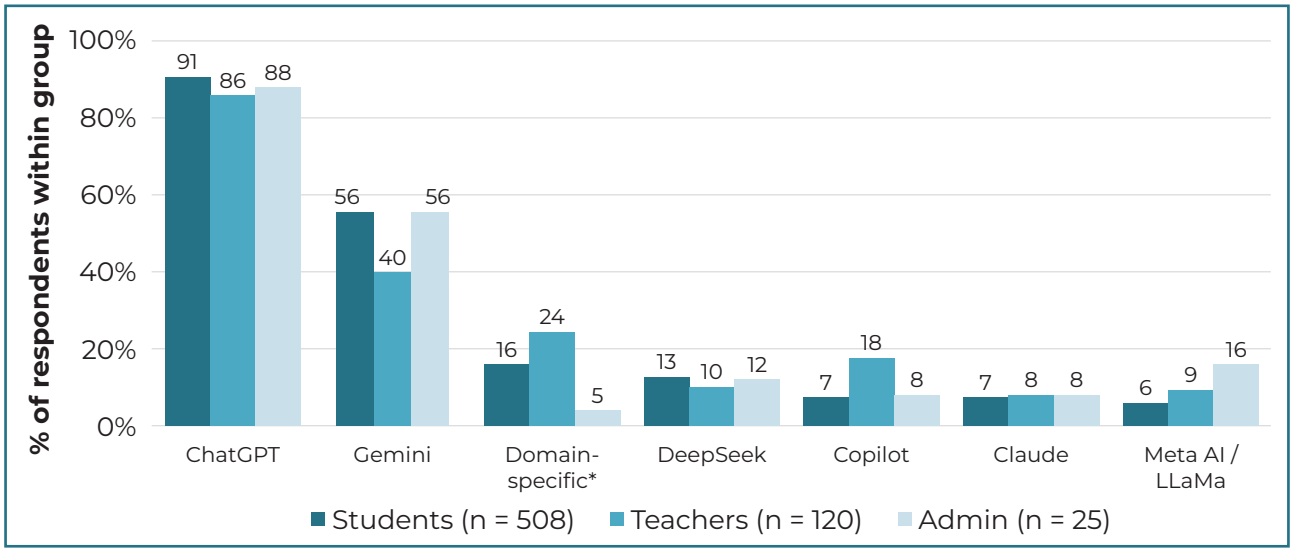



**Figure 1.** Use of specific AI models by respondent group at USMF (multi-select; bars represent the percentage of respondents within each group reporting use of the model)

** Domain-specific medical AI tools include AMBOSS AI, OpenEvidence and NotebookLM.*

**Subscription patterns and access.** Free-tier access dominated across all groups but with marked role-related variation (Table 2). Among students, 79.3% used only free versions and 19.6% reported any form of paid subscription, almost exclusively funded from personal resources. Among teaching staff, free-only use was reported by 55.8% and 43.4% maintained at least one paid subscription. Among administrative personnel, 80.0% used free tiers only and 20.0% reported a single paid subscription. No respondent reported institutionally funded access in any group.

**Frequency of use.** Daily use of AI tools was reported by 24.2% of students, 15.0% of teachers and 20.0% of administrative personnel. When daily and frequent use were combined, more than half of students (53.9%) and a substantial proportion of teachers (42.5%) and administrative staff (44.0%) used AI tools at least frequently. The full distribution of frequency categories by group is shown in Table 2.

**Table 2.** Subscription type by respondent group

| Subscription type | Students (n = 508) | Teachers (n = 120) | Admin (n = 25) |
|---|---|---|---|
| Free versions only | 79.3% | 55.8% | 80.0% |
| Single paid subscription (personal funds) | 14.8% | 39.2% | 20.0% |
| Multiple paid subscriptions (personal funds) | 2.0% | 4.2% | 0.0% |
| Mixed free and paid | 2.8% | 0.8% | 0.0% |
| Other / does not use AI | 1.2% | 0.0% | 0.0% |

Among students, the proportion of daily-or-frequent users varied only modestly across years of study, with the highest combined values observed in Year 3 (60.3%) and Year 4 (61.6%) and the lowest in residency (37.5%); however, daily use itself was relatively stable (range 18.7%–30.9%) across the curriculum.

**Comfort and self-rated skill.** Among students, self-rated comfort with generative AI tools was distributed as follows: 5.5% identified as novices (no experience), 36.2% as aware (simple tasks), 52.6% as competent (regular use for studying) and 5.7% as advanced (advanced use or prompt engineering).

**Frequency of use by tool category and purposes of use among students.** Frequency of use varied substantially across AI tool categories (Figure 2). Large language models were the most frequently used category, with 45.5% of students reporting frequent or daily use, while writing and grammar assistants were the least used (only 7.1% frequent or daily). Quiz/flashcard generators and adaptive learning platforms occupied an intermediate position.

Across the four educational purposes assessed, AI was most often deployed as an explanatory aid: 53.7% of students reported using it to a large or very large extent for explaining complex academic and medical concepts. Use for summarising literature was less intensive (35.8% large/very large extent), and use for generating practice exam questions (24.0%) and for planning study schedules (18.9%) was lower still (Figure 2).

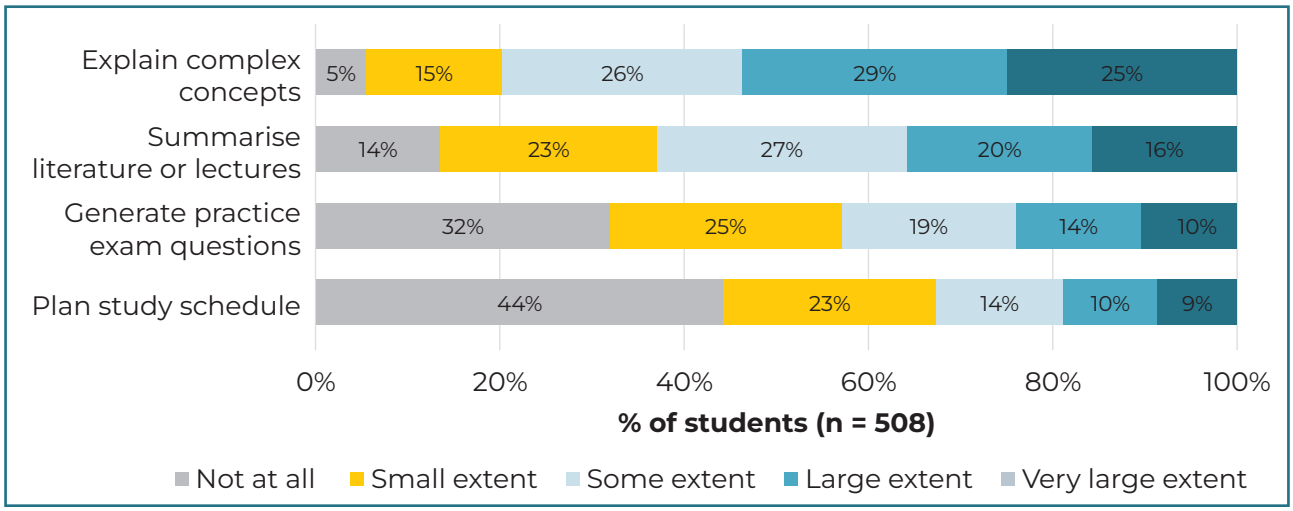



**Figure 2.** Extent to which students reported using AI tools for four educational purposes (n = 508)

**Attitudes, concerns and curriculum preferences (students).** Student attitudes toward AI were predominantly positive (Figure 3). A clear majority, 358 of 508 students (70.5%), agreed or strongly agreed that AI will improve access to information, while only 7.9% disagreed. Views on whether AI use will reduce empathy and human interaction were more polarised: 31.1% agreed, 36.8% disagreed and 32.1% remained neutral. Support for mandatory AI education in the medical curriculum was substantial: 48.2% of students agreed or strongly agreed, 32.5% were neutral and only 19.3% disagreed. Concern about data privacy through AI use was moderate, with a mean score of 2.71 (SD 1.33) on a 1–5 scale; 26.2% of students were clearly concerned (score 4 or 5) and 42.3% were not concerned (score 1 or 2).

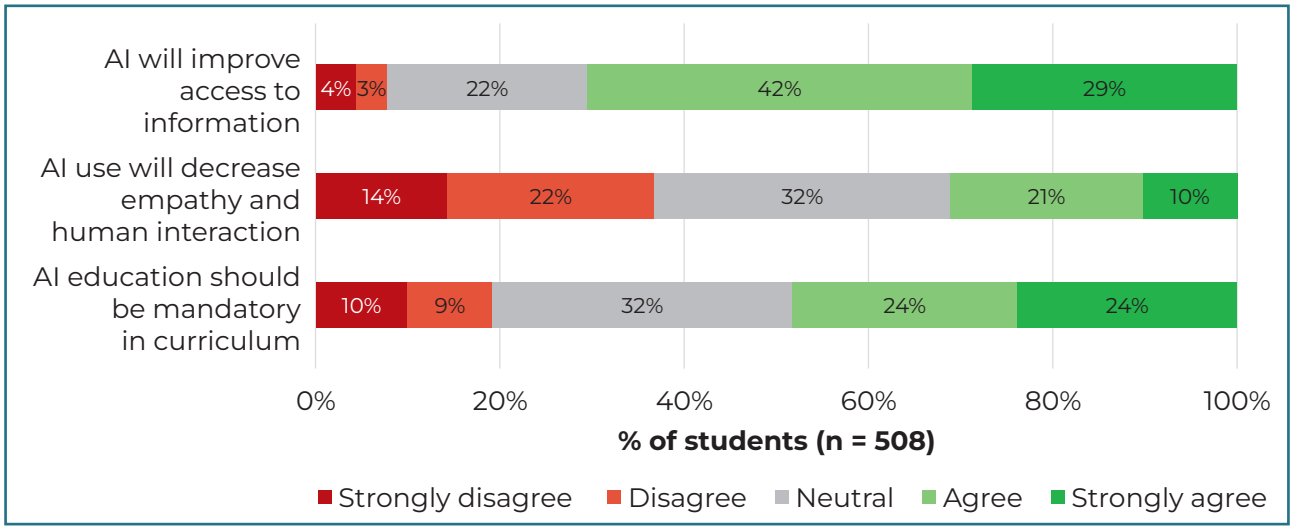



**Figure 3.** Distribution of student responses to three Likert-type attitude statements about AI in medical education (n = 508)

**Teaching staff: policies, uses and barriers.** Teaching staff adopted predominantly conditional approaches to student AI use. Specifically, 35.0% allowed AI for selected activities only, 27.5% required students to declare AI use explicitly, 6.7% allowed AI without restriction, 12.5% prohibited AI use outright and 18.3% had not yet established a clear policy. The perceived impact of AI on teaching activity was moderate-to-high (mean 3.71/5; 56.7% rated impact at 4 or 5). Reported professional uses of AI in the past year clustered around the creation of visual materials or clinical scenarios for courses, drafting of scientific manuscripts and literature reviews, and analysis of research data.

Concerns about scientific accuracy ("hallucinations") and academic integrity (plagiarism) were the dominant barriers reported by teaching staff (Figure 4). Lack of institutional training, lack of time and lack of technical support also affected substantial minorities.

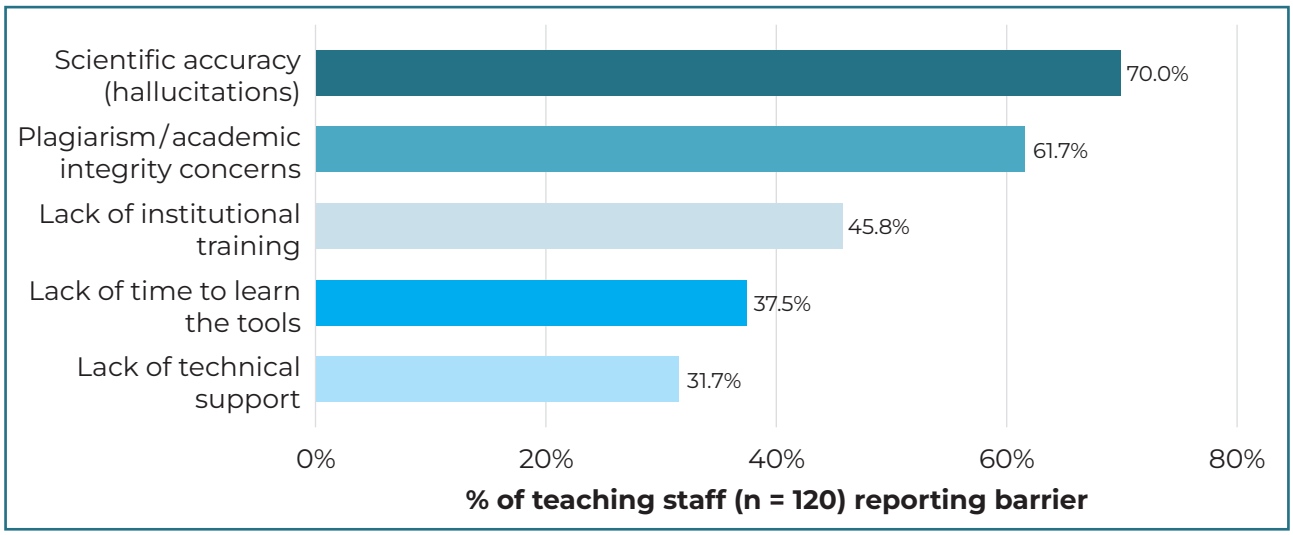



**Figure 4.** Barriers to AI integration in teaching reported by USMF teaching staff (n = 120; multi-select).

**Table 3.** Teaching staff agreement with AI-related attitude statements (n = 120).

| Statement | Disagree+ | Neutral | Agree+ | Mean (0–4) |
|---|---|---|---|---|
| Confident in accuracy of AI responses in my academic context | 34.2% | 36.7% | 29.2% | 1.99 |
| University provides sufficient AI resources and clear policies | 45.8% | 40.0% | 14.2% | 1.52 |
| Legal/ethical responsibility for AI errors lies solely with human user | 6.7% | 20.8% | 72.5% | 3.03 |

Three Likert-type attitude statements addressed teachers' confidence and perception of institutional support (Table 3). Only 29.2% of teachers agreed or strongly agreed that they were confident in the accuracy of AI responses in their academic context, indicating a healthy professional scepticism. Just 14.2% agreed that the University provides sufficient resources and clear policies on AI use, while 45.8% disagreed or strongly disagreed, the strongest single negative signal observed in the survey. Conversely, 72.5% of teachers agreed that the legal and ethical responsibility for AI-assisted errors lies solely with the human user.

Administrative staff. Among administrative respondents (n = 25), AI tools were most commonly used for drafting, summarising or correcting emails and official communications, for translating documents and for generating reports or administrative procedures. Areas perceived as offering the greatest efficiency improvements were document management, automation of repetitive tasks and reports/data analysis. Principal barriers reported were concerns about data security and confidentiality, lack of training in effective use, and IT restrictions or lack of access to safe AI tools at the workplace. Strikingly, 24 of 25 administrative respondents (96.0%) considered that formal AI training would improve their work efficiency to some or to a large extent, the highest training appetite recorded in any group surveyed. These findings should be interpreted in light of the small sample size.

**Discussion**

This single-institution cross-sectional survey provides, to our knowledge, the first systematic empirical characterisation of generative AI use across the academic community of a medical and pharmaceutical university in the Republic of Moldova. Three findings warrant particular emphasis. First, generative AI tools, and ChatGPT in particular, have already become a routine part of academic and professional life for students, teachers and administrative staff at USMF, with adoption levels comparable to those reported in the most digitally mature settings internationally. Second, despite this widespread uptake, only a small minority of teaching staff perceive that the institution provides adequate guidance, while concerns about scientific accuracy and academic integrity are the dominant barriers to confident pedagogical use. Third, the level of demand for formal training expressed by both teaching and administrative staff substantially exceeds the structured opportunities currently available within the institution.

The observed prevalence of any AI use among USMF students (98.6%) and the proportion using ChatGPT specifically (90.6%) align closely with, and in some respects exceed, comparable international figures. In the United States, Ganjavi *et al*. reported 96% awareness and 52% direct use of ChatGPT for coursework within months of release [6]; subsequent surveys in the United Arab Emirates [7], Thailand [8], Germany [11], Egypt [10] and Saudi Arabia [11] have reported usage preva-

lences ranging from approximately 49% to 85%. Our findings situate USMF firmly in the upper range of this distribution, despite the relative paucity of institutional infrastructure and the country's middle-income economic context. The dominance of ChatGPT across all three respondent groups is also consistent with international patterns, which have repeatedly identified the OpenAI flagship as the de facto entry point for generative AI in medical and health-professions education [3, 6, 12]. The relatively limited uptake of medically specific tools (AMBOSS AI, OpenEvidence, NotebookLM), concentrated, as expected, among teaching staff and students, suggests that diffusion of clinical-grade AI products lags substantially behind that of general-purpose AI tools, an observation also reported in larger institutional samples [13].

The free-versus-paid divide observed in our data raises an important equity concern. With 79.3% of students relying exclusively on free tiers and only 19.6% reporting personally funded paid subscriptions, the most capable models, which typically reside behind a paywall, are systematically less accessible to the student body than to teaching staff (43.4% paid). The published literature has only begun to address the educational implications of this differential access [3, 12, 18], but the basic concern is intuitive: students using free tiers may be exposed to higher rates of factual error, more limited reasoning ability and fewer safety guardrails than colleagues with paid access, with potential downstream effects on the quality of their study output and clinical preparation. The complete absence of institutionally funded access in our sample, across all three groups, points to an opportunity for negotiated educational licensing as a relatively low-cost intervention with broad institutional reach.

The perception barriers reported by teaching staff are consistent with international findings. Concerns about hallucinations [14, 15] and academic integrity [16, 17] are the two most frequently identified obstacles in surveys of medical educators in the United States [21, 22], Germany [11] and Saudi Arabia [11]. The importance of these concerns is underscored by recent technical literature documenting the persistence of hallucinations even in the most capable contemporary models, and the limited reliability of automated AI-text detectors for academic integrity enforcement [14–17]. The strikingly low proportion of USMF teaching staff who perceive that the University provides sufficient AI resources and policies (14.2%) is also broadly consistent with the international evidence base, in which only a minority of medical schools report having formal generative-AI policies in place [20, 21]. However, the simultaneous and very high level of consensus on user accountability (72.5% agreeing that legal and ethical responsibility lies with the human user) suggests that the conceptual foundation for a clear, simple use-and-disclosure policy at USMF is already broadly accepted by the faculty. Such a policy would not need to legislate detailed permissions across diverse pedagogical contexts; instead it could codify, formalise and operationalise a principle on which the teaching community already agrees.

From a curricular perspective, the combination of high but unsystematic student uptake (52.6% self-rating as "competent" but only 5.7% as "advanced") and substantial student support for mandatory AI education (48.2%) provides a clear empirical mandate for the introduction of a structured AI literacy component within the medical and pharmaceutical curriculum. The competencies proposed in recent international frameworks, including foundational concepts, practical skills (notably prompt design and critical appraisal of AI output), ethical and regulatory dimensions, and clinical-application literacy [13, 18, 23–25], provide a directly applicable scaffold for such curricular development. The relatively limited use of AI for evidence-based study practices such as practice-question generation and study-schedule planning, despite the well-established benefits of these activities in medical learning, suggests that even a modest curricular intervention focused on practical study applications could deliver measurable educational value.

The almost universal training appetite expressed by administrative respondents

(96.0%) is one of the most actionable findings of the survey. Although the administrative sample is small, the consistency of the signal across questions about use cases, perceived efficiency gains and barriers (lack of training, data-security concerns, IT restrictions) suggests that short, structured training cycles for administrative staff, paired with institutional guidance on safe data handling, would be welcomed and would address acknowledged risks of unstructured use of consumer-grade tools for institutional data.

The principal strength of this study is its scale and inclusiveness: with 653 respondents drawn from all three principal academic constituencies of USMF, the study offers an unusually comprehensive snapshot of an entire institutional community at a critical moment in the diffusion of generative AI. Several limitations should be acknowledged. First, this was a self-selected, single-institution online survey, and both selection bias (over-representation of respondents already engaged with AI) and self-report bias (in particular, social-desirability effects on attitude items) are likely. Second, the administrative subgroup is small (n = 25) and the corresponding estimates should be interpreted as indicative rather than definitive. Third, year-of-study representation favoured Year 1 students, which may bias certain estimates toward earlier-career perspectives.

## Conclusions

Generative AI tools have become a routine part of academic life across the USMF community, with adoption comparable to or exceeding levels reported in better-resourced international settings. ChatGPT dominates use across students, teaching staff and administrative personnel, while reliance on free tiers, particularly among students, raises equity and quality concerns. Teaching staff express moderate-to-high perceived impact of AI on their teaching but also substantial scepticism about accuracy and integrity, and they overwhelmingly perceive a lack of clear institutional guidance. Student attitudes are predominantly positive and a substantial proportion support mandatory AI education in the curriculum, while administrative staff report a near-universal demand for formal training. Together, these findings provide a robust empirical foundation for the development of an institution-wide AI use-and-disclosure policy, the integration of AI literacy into the medical and pharmaceutical curriculum, and the provision of structured training and licensed tool access for academic and administrative staff at USMF.

## Acknowledgments

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# STUDY ON THE INTERNATIONAL NURSING STUDENTS' EXPERIENCES REGARDING CARE FOR ELDERLY PATIENTS WHILE DOING CLINICAL PRACTICE

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**ABSTRACT. Aim of the study.** To get deeper insights and understand of international nursing students experience and challenges regarding care for elderly patients while doing clinical practice. **Methods.** A qualitative research method was used for this study. The study included 11 foreign bachelor Nursing program students from the third and fourth year of Faculty of Nursing in the Lithuanian University of Health Sciences. The collection of the data was conducted from December 2025 to January 2026. **Results.** The results of this study indicates that international nursing students encounter major issues such as limited clinical practice, language, and dealing with complex needs of elderly patients, which cause low levels of confidence, anxiety, and communication differences and resulting in patient safety and quality of care. Despite these challenges, students also experienced cultural and emotional difficulties, but with the help of mentorship, peer and family support, the students eventually develop the ability to be competent, self-confident, and resilient. **Conclusion.** International nursing students in geriatric care require supportive and organized learning environments to enhance their competence and well-being. Practical planning, such as exposure in the clinical setting, language education, and productive mentorship, is essential to solve the main difficulties. Confidence can be improved by increasing support systems that can lead to safer and better quality of patient care.

**Key words:** international nursing students, elderly patients, clinical practice.

## Introduction

The healthcare sector is experiencing a significant demographic transformation that is being characterized by an aged population. It is estimated that the number of individuals aged 65 years and above will almost be doubled to 1.6 billion by 2050 compared to 761 million in 2021, thus putting a big strain on gerontological nursing [1]. This population necessity is combined with the other trend on the internationalization of nursing education in the world. International Nursing Students (INSs) are becoming more and more important for institution of higher learning in countries such as the United States (US), the United Kingdom, Australia and Canada to serve as capacity fillers and provide a culturally diverse work force in healthcare [2, 3]. INSs are students who have left their country of origin and shift to a different country to pursue a pre- registration nursing degree [4].

The two trends intersecting implies that an increasing percentage of nurses and nursing students internationally trained to manage older adults [5]. Nevertheless, INSs encounter a specific collection of issues that can significantly influence their clinical learning experiences, especially in the challenging and delicate healthcare area of elderly care. These issues include major language and communication obstacles, cultural difference in attitude towards aging and care, acculturative stress, and coping with foreign healthcare system and pedagogical methods [6, 7]. Learning experience includes getting used to new standards of communication and cultural expectations in clinical environments, such as patient communication and protocols used in

clinical staff, which is the main aspect of their learning, and their success in dealing with linguistic and cultural challenges influences their capacity to provide effective care and build professional confidence [8].

To work with elderly patients, it is necessary to have a certain set of skills, which include clinical knowledge, empathy, patience, and the highly developed communication skills [9, 10]. The needs of elderly patients are so complex, multimorbid, polypharmacotherapeutic, as well as delusional and delirious, that they make care and communication difficult [11, 12]. And in the case of INSs, these complexities do not help as they are newcomers. The inability of people to understand the slang, idioms and accent in one country and age-related hearing loss or cognitive impairment in-patient can present an impressive hindrance to communication [13, 14]. Also, cultural values that are deeply rooted, like filial piety, respect towards older peoples and emotional displays, can be a path towards widespread misunderstanding, ethical dilemmas, and internal conflict both in the country of origin of the INS and in their host country [15,16]. However, in spite of the paramount importance of this topic, the research specifically related to this area, i.e., intersecting international student status and clinical learning in geriatric care facilities, is rather limited.

These experiences are not only express an academic concern but constitutes a practical requirement by nursing educators, clinical supervisors and health institutions. With the determination of the challenges that are faced specifically by INSs, specific support systems, pedagogic interventions and curriculum modifications may be enacted. Not only will this increase the educational experience and well-being of INSs, but eventually, it will help to improve the quality and safety of care provided to the rising number of elderly patients [17, 18]. The literature review synthesis the existing evidence to understand students who learn to work with the elderly in clinical environments. Thus, the present study seeks to evaluate students' experiences of caring elderly patients in clinical practice during clinical placements according to the areas of concern presented below.

**Language and communication barriers.** Language barrier is the most mentioned and significant barrier facing the INSs and is even further complicated when treating the elderly patients. The formal academic competence of the language used in the country of residence frequently shown by INSs, as well as the lack of conversational fluency and cultural vocabulary to facilitate effective therapeutic communication [19]. Older patients can employ colloquialisms, slangs or historical allusions that not well known to INSs [6]. Moreover, age associated parameters like hearing impairment, post – stroke aphasia or language impairment like dementia complicate communication intrinsically, and these issues compounded by factors such as a non- native accent or language fluency in the case of a student [20]. This may cause miscommunication about patient needs, medication errors, and failure to establish a connection, which can cause high levels of student's anxiety, frustration, and feeling of professional inadequacy [21]. Nevertheless, they are not always effective in high stake geriatric setting where patients' safety requires the use of precise communication [22]. Language workshop are targeted interventions that area required to help INSs gain effective communication skills [23]. Also, it is possible to include simulation-based training so that the INSs could be provided with life like situations to train the language proficiency in geriatric care to allow them to develop confidence and minimize errors in real life communication.

**Impact on clinical confidence.** The anxiety of committing language mistakes will diminish the trust of INSs in their clinical skills. As an example, as INS might be reluctant to interact with patients and ask questions because he/she is afraid of being misinterpreted, which restricts his/her learning [24]. Such insecurity may lead to a fear cycle, as the students become afraid to engage in clinical activities, which even more impairs their progress [21]. More importantly, this cycle can be interrupted with the help of structured mentorship program that will give INSs safe environment to practice their communication skills and increase their confidence and interest in working with geriatric care environments.

**Patients perceptions and interactions.** Older patients might interpret the communication problems as incompetence or insensitivity, thus, damaging the relationship between a nurse and a patient [25]. An example would be, patients who has hearing impairments, patients will be frustrated by the accent of an INS, who will then mistrust or experience less satisfaction will the care [20]. This dynamic may prevent the INS to interact with the patients in the full manner affecting their learning experience of the clinical experience.

**Differences in culture and ethical issues.** Cultural norms often lead to confusion and ethical dilemmas in INSs when they come across what is different to their own culture. Medical cases involving autonomy, truth telling and informed consent may differ greatly depending on the culture [26]. As an example, a student in a culture which values family consensus in decisions may have a hard time in the Western approach of a patient making as unwise decision than the student thinks in wise [27]. There are also differences between cultures on the attitudes towards aging and respect: whereas some cultures treat elders with respect and insist on filial piety, others may consider ageist or adopt a more relaxed and egalitarian attitude towards contact [28]. The differences may influence all aspects such as the style of communication (e.g. First names and surnames), the understanding of what is meant by dignified care [29].

**Managing the cultural expectations in provision.** The INSs can have difficulty in acculturating to the culture of the host country. As an example, a student in the hierarchical culture might not be comfortable with addressing an old patient with his or her first name and think that it would be regarded as disrespectful [29]. This may cause confusion with patients or preceptors who may misunderstand the actions of the student as being cold or uninterested [30]. It is also possible to support the cultural orientation program to make INSs aware of the local norms and expectations so that it will be easier to go through these interactions and lead to positive relationships in geriatric care environments.

**Ethical dilemmas in decision making.** When the cultural values of INSs are in conflict with clinical practices, this brings about an ethical dilemma. An example is this that a student with the notion that it is ethical to protect older patients against painful diagnoses will not find it easy with Western principles of complete disclosure, thus causing moral distress [26]. Such conflicts may affect the emotional health and clinical performance of the student, which makes them depend on the help of educators and preceptors [27]. It is also possible facilitating the discussion of how to balance cultural values with clinical expectations, to increase their capacity to provide compassionate geriatric care.

**Geriatric cultural sensitivity.** Cultural sensitivity is a vital practice that INSs need to develop to offer dignified care to the geriatric patients. As an example, cultural predispositions to aging can assist INSs in negotiating relationships with patients that require formal respect or the family [28]. Cultural competence training may enable INSs to manage these disparities efficiently to improve patient care [16]. Moreover, incorporating real – life case studies into cultural competence education may assist INSs to put these skills into practice and establish a firmer therapeutic bond with aging patients in geriatric care units.

The language barrier and cultural difference cause a major problem in geriatric care to international nursing students (INSs). Communication barrier that impedes communication with older patients can cause misunderstandings, medication error, lack of Clinical confidence and poor patient relationship, particularly hearing loss and Dementia. The coping mechanism of INSs such as non-verbal communication are not always sufficient and Intervention such as the language workshops are needed. Ethical dilemmas are the results of cultural differences, with INSs facing different notions of autonomy, informed consent, and attitude towards aging, which may go against those of the Host country. Such difference can result in misunderstandings, ethical distress and the difficulties in care delivery and cultural competence training is needed to increase the capacity of INSs to deliver dignified and patient-centered geriatric care.

**Aim of the study** – to get deeper insights and understand of international nursing students experience and challenges regarding care for elderly patients while doing clinical practice.

## Material and methods

**Study design and organization.** A qualitative research method was employed to investigate the experiences of the international nursing students (INSs) in their work with elderly patients. The data collection method that was selected as semi-structured individual interviews was determined to enable the respondents to be open in their experiences, but to ensure that the discussions covered important research issues.

Interviews were arranged at a time that would be convenient to the participant and selected to take about 15 to 25 minutes, depending on the availability of the participant and the level of discussion. The interviews were recorded and given the consent of the participants then anonymized and transcribed to be analysed. The collection of the data was conducted during the two months of December 2025 to January 2026.

**Ethical principles**. The LSMU Bioethics Centre provided ethical approval (Approval No. 2025-BEC2-1493) and gave permission to conduct the study. Interviews were held in a private classroom to make the participants feel safe and comfortable. The research was conducted on the principles of voluntary participation, the right to privacy, observing dignity and autonomy.

**Participant selection and characteristics**. The respondents were the international nursing students of the LSMU Nursing program. Inclusion Criteria were 3rd, and 4th year nursing international students, have done clinical practices, agreed to participate in this research. Exclusion Criteria was Lithuanian nursing student. The sampling was conducted through convenience sampling where the students who had undertaken the clinical placements with the elderly and volunteered to take part in the in-depth interview were selected. The data collection was made until there was no new information that was coming up and this indicated that the data had saturated.

In total 11 students take part in the study. The general characteristics of the respondents are presented below in Table 1.

**Table 1.** Characteristics of the study participants

| No. | Participants/Code | Gender | Year of study | Area of origin |
|---|---|---|---|---|
| 1 | Student 1 (S1) | male | Fourth Year | Asia |
| 2 | Student 2 (S2) | male | Fourth Year | Asia |
| 3 | Student 3 (S3) | female | Fourth Year | Africa |
| 4 | Student 4 (S4) | female | Fourth Year | Asia |
| 5 | Student 5 (S5) | female | Fourth Year | Asia |
| 6 | Student 6 (S6) | male | Fourth Year | Asia |
| 7 | Student 7 (S7) | female | Fourth Year | Asia |
| 8 | Student 8 (S8) | female | Third Year | Asia |
| 9 | Student 9 (S9) | male | Third Year | Asia |
| 10 | Student 10 (S10) | male | Third Year | Asia |
| 11 | Student 11 (S11) | female | Third Year | Asia |

**Process of data analysis**. The data analysis based on qualitative content analysis, which is suitable for systematically examining the data presented in the interview and determining the presence of patterns and meanings [31]. After collecting the data, the researcher transcribed all the audio recordings verbatim. To maintain the confidentiality of the participants, the transcripts were anonymized using unique identifiers (e.g., Student 1, Student 2) .

The analysis process involved several stages. At the beginning of the study, the researcher read each transcript repeatedly to familiarize themselves with the content and gain a general understanding of the participants' experiences. Next, significant statements and phrases relevant to the research were identified and assigned initial codes. These codes represented major thoughts, issues, feelings, and coping behaviours explained by the participants [31].

Then related codes were combined under broader categories based on similarity of meaning. Based on these, they were assigned to the themes that highlighted the primary experiences and issues faced by international nursing students when working with elderly patients. The final themes were considered and narrowed down to reflect the data well and be closely aligned with the study's aim and objectives [31].

Consistency and transparency given careful consideration throughout the analysis. Constant comparison of the codes and themes in the transcripts ensured that the results were data-driven and accurate in reflecting the views of all participants. Main themes, categories, codes presented in Table 2.

**Table 2.** Main themes, categories and codes

| Main themes | Categories | Codes |
|---|---|---|
| Experience and challenges related to caring for Elderly patients | Limited Clinical Experience in Geriatric Care | Limited practice, unfamiliar procedures, lack of confidence, trial-and-error learning |
| | Challenges to Manage Physical and Cognitive Condition | Dementia, cognitive impairment, mobility issues, multimorbidity |
| | Cultural Differences | Diverse beliefs, traditional expectations, patient preferences, family involvement |
| | Emotional Challenges | Anxiety, frustration, emotional burden, empathy fatigue |
| Experiences of language barrier on communication and care delivery | Difficulties in Verbal communication with Elderly Patients | Misunderstandings, accent issues, difficulty explaining procedures, unclear instructions |
| | Communication with Cognitively Impaired Elderly Patients | Repetition, simplification, non-verbal cues, patient confusion. |
| | Strategies Used to Overcome Language Barriers | Gestures, peer translation, simplified explanations, written aids |
| | Emotional Impacts of Language Related Communication Difficulties | Stress, fear of errors, frustration, reduced confidence |

**Table 2.** Continued

| Main themes | Categories | Codes |
|---|---|---|
| Formal and Informal support system in clinical practice | Support from Clinical Supervisor and Mentors | Guidance, instruction, constructive feedback, supervision |
| | Peer Support Among International Nursing Students | Shared experiences, advice, emotional support, collaboration |
| | Family and Social Support Outside the clinical environment | Motivation, emotional reassurance, stress management, virtual contact |
| | Perceived Gaps in Available Support systems | Need for language training, cultural orientation, structured mentorship, additional resources |

**Results and discussion**

**Experience related to caring for elderly patients.** The testimonies of students reported complex barriers in geriatric care, which have to combine lack of experience with adaptive trust-building in various environments. Such difficulties tended to increase the sense of insecurity, which explains why guided practice is valuable in development of competence. Finally, this field leads to the need to have early and focused education to prepare the learners to meet emotional and practical needs of the aging populations.

This is in line with the overall comprehension that communication in nursing is a multifaceted process involving the exchange of the meaning, ideas, and sentiments. Cognitive and sensory impairments also complicate this process in geriatric environments, and the students must continuously adapt their communication strategies.

**Limited Clinical Experience in Geriatric Care.** Students reported limited confidence and difficulty in establishing patient relationships due to insufficient prior clinical exposure, leading to hesitation during procedures. This reliance on improvisation highlights gaps in clinical preparation and delays skill acquisition.

Early structured clinical exposure been shown to improve readiness and reduce trial-and-error learning among nursing students, emphasizing the importance of guided training environments [32]. Participants described limited practice, unfamiliarity with procedures, and reduced confidence, often resulting in anxiety and self-doubt. These findings indicate a clear disconnect between theoretical knowledge and practical competence, consistent with existing literature [33]. Additionally, students reported maintaining a professional appearance to sustain patient trust, which may act as a coping mechanism in high-pressure settings but can hinder authentic learning experiences:

*"...If we lack much experience, we must act as professional nurses so patients trust us; sometimes when taking blood, we attempt one vein but fail, leading them to assume we know nothing" (Student 1).*

*"Lack of experience can reduce confidence and increase anxiety when performing procedures" (Student 7).*

*"My lack of experience makes me feel like less confidence... especially when handling difficult conditions" (Student 9).*

*"Being new in the clinical settings severely affected my confidence and trust in myself. I constantly feared making mistakes, which made me hesitant in decision making and anxious during patient care" (Student 10)*

Overall, the lack of clinical experience contributed to anxiety and lack of self-trust among the students, as well as to them relying on learning by trial and error. Although

professional pretence was useful in preserving patient trust, it added emotional discomfort and reduced chances of guided skill development, which highlights the necessity of formal early clinical exposure.

**Challenges to manage physical and cognitive condition.** Students identified caring for elderly patients with mobility limitations, cognitive impairments, and multimorbidity as physically and emotionally demanding. These conditions required increased effort, patience, and careful handling, often leading to anxiety about causing harm. Similar findings have been reported, emphasizing that geriatric care requires both precision and sensitivity [34].

Participants described physical strain during patient repositioning and challenges in managing confusion and memory loss among elderly patients. Without adequate ergonomic training and geriatric-focused preparation, students experienced both physical exhaustion and emotional fatigue. Current literature highlights the importance of incorporating gerontology and frailty-focused education into nursing curricula to better prepare students for such demands [34].

Students shared the subjects described cognitive impairment, mobility issues, and multimorbidity.

*"...When I was in haematology department, I found that a patient's body weight made caregiving physically demanding. I had to assist them with repositioning, which required a lot of effort and careful handling." (Student 5).*

*"...While caring for overweight patients, I struggled with lifting and changing their position. The physical strain made me more aware of the need for proper technique and assistance." (Student 8).*

*"...In my experience with elderly patients, I observed that many had limited mobility and memory problems such as confusion. Providing care to them required greater patience and closer supervision from me." (Student 9).*

*"...the patients with limited mobility were challenging for me as an international student. Moving an overweight patient for procedures like an X-ray demanded extra coordination and physical effort." (Student 10)"*

*....umm...assisting fragile elderly patients made feel anxious about unintentionally causing them pain. Their condition required me to be extremely cautious and gentle in every movement." (Student 11).*

Overall, students experienced significant physical and emotional stress while caring for elderly patients with complex needs. These findings underscore the importance of specialized training in frailty care and safe patient handling to enhance both student preparedness and patient safety.

**Cultural differences.** Cultural differences emerged as a significant barrier, influencing communication, patient acceptance, and student integration into clinical environments. Participants reported variations in beliefs, family involvement, and attitudes toward care, which sometimes led to discomfort or refusal of care. In some cases, students experienced discrimination or bias based on their nationality or appearance. These findings align with research indicating that cultural diversity in healthcare settings can lead to misunderstandings and negative learning experiences if not properly addressed [6, 29]. Differences in expectations regarding physical contact, religious practices, and family roles further complicated patient interactions.

The variety of beliefs, conventional demands, patient choices, family intervention was mentioned in some participants stories. *"...While caring for some patients, I noticed that they were not comfortable with physical touch. I had to respect their feelings and be more careful in how I approached them." (Student 2).*

*"...I experienced situations where elderly patients refused care because of their personal beliefs. Some of them were not comfortable being treated by an international student like me." (Student 4.).*

*"...One patient was using the sign of Jesus while I was caring for her. I felt that her religion might be different from mine, and it made me think about how beliefs can affect care." (Student 5).*

*"...I noticed differences in beliefs about illness, personal space, and family involvement. Because of this, I had to be more un-*

*derstanding and respectful in my practice." (Student 7).*

*"...Some elderly patients preferred traditional ways of care. They did not feel comfortable being treated by a foreign student."(Student 9).*

*"...At times, the experience was painful for me, especially when I felt judged because of my skin colour. Some patients seemed to make decisions about me before even knowing me." (Student 10).*

*"....In my country, many relatives usually stay with elderly patients in the hospital. Here, I was surprised because I rarely saw family members around them." (Student 11).*

International students experienced significant interpersonal challenges including different norms of family involvement or outright cases of discrimination according to the research. Students reported a marked difference between their native cultural backgrounds and the clinical setting in the locality with aspects of physical contact, religious manifestations as well as the presence of relatives at the bedside. Most importantly, some students noted that they were not integrated by the prejudices and racism of patients, and some of them were not even accepted due to the colour of their skin or being considered a foreigner. To address such tensions, the results indicate that future intervention should be driven by the introduction of a curriculum centered on cross-cultural sensitivity and learning by example to ensure student welfare and moderate relationships with the provider.

**Emotional challenges.** Students reported significant emotional burden, including anxiety, stress, empathy fatigue, and fear of making clinical errors. The responsibility of caring for vulnerable elderly patients, combined with limited experience, contributed to emotional exhaustion and self-doubt. These findings are consistent with literature emphasizing the need for improved emotional preparedness in geriatric care education [35]. Students adopted coping strategies such as emotional detachment and reframing patient behaviours; however, these approaches were not always sufficient to manage the psychological demands of clinical practice.

The students who reported anxiousness, frustration, emotional burden, empathy fatigue.

*"...We used to get so upset emotionally in the beginning; it was almost overwhelming. The duty to the patient remains, even when our own emotional cup is empty."(Student 11).*

*"...This is definitely an emotionally draining work that one has to do day in and out have had to go through the process of learning how to survive and most importantly learn to detach. I also attempt to keep in mind that when a patient is angry, it is not my fault, but his or her pain. I cannot blame myself in the event that I desire to continue presenting myself." (Student 10).*

*"...Some days, honestly, just make me feel so bad, it is difficult to continue. Whenever your experience with someone is not a good one, or when you had a tough shift, it does not simply remain at the place of work but accompanies you back home. I am fully discouraged and asking myself whether I am in the right career or not." (Student 5).*

*"...The pressure is great, and it actually strips my personal confidence. This is a great sense of anxiety that I am always fighting with and a crippling fear of not doing something correctly. One feels like anything can be a disaster in this atmosphere and that fear prevents one to take a decisive move." (Student 7).*

*"...I have had some very cruel situations that have taken me by surprise. It comes to some point when it is so personal and it wound up not just hurting me but more so than I anticipated. You are a professional, and there are cases that impact you that you can hardly forget about." (Student 8).*

Overall, the findings demonstrate that emotional strain is a critical aspect of geriatric nursing education. Incorporating reflective practices and structured emotional support into training programs is essential to enhance resilience and prevent burnout.

**Communication, language barrier and care delivery**

Persistent communication difficulties disturbed the assessment and created frustration, particularly with vulnerable groups. The

students were getting adapted creatively with safety risks being reported. This area requires integrated language applications to protect communications.

**Issues of verbal communication with elderly patients.** Language barriers significantly affected communication, patient safety, and quality of care. Students experienced difficulties in explaining procedures, understanding patient needs, and building trust, particularly with elderly patients who did not speak English. These challenges often resulted in frustration and disrupted care delivery. These findings supported by previous studies identifying language barriers as a major contributor to communication breakdown and reduced patient satisfaction [22, 36]. Additionally, design-related challenges in translation tools and communication systems have been highlighted in geriatric care settings.

Participants mentioned misunderstandings, accent problems, problems explaining procedures, and vague instructions.

*"...Most of the elderly patients do not speak English at all. It is really difficult to talk to them. I want to help, but we just cannot understand each other." (Student 1).*

*"...The language barrier is the biggest problem we have. If you don't know their language, you feel like you can't do anything. We cannot give good care if we cannot speak to the patient." (Student 8).*

*"...It is very hard to explain a medical procedure to someone who doesn't understand me. I want to tell them what I am doing so they aren't scared, but I don't have the right words." (Student 4).*

*"...If I can't speak their native language, I can't understand what they need. I don't know if they are in pain or where it hurts. This makes it very difficult to do my job safely." (Student 10).*

*"...It is so hard when you don't know the language. Also, elderly patients often speak with very quiet voices. So, between the different language and the low volume, I can't hear or understand anything". (Student 11).*

During the research indicate that language discordance and auditory difficulties provide a serious obstacle to safe and effective geriatric care. Students said that the absence of a common language or different accents often caused interruption in care delivery as students could not describe procedures or evaluate such critical signs as the level of pain. To fill this gap, the evidence indicates that the key is to make use of specific training in medical conversation and linguistic adjustments in order to regain patient trust and provide clinical safety.

**Communication with cognitively impaired elderly patients.** Students reported additional difficulties when communicating with patients experiencing cognitive decline, such as dementia and confusion. These situations required repeated explanations, simplified language, and increased reliance on non-verbal communication. These findings are consistent with research emphasizing the need for adaptive communication strategies when working with cognitively impaired patients [37].

Students reported repetition, simplification, non-verbal cues, and patient confusion.

*"...Caring for the elderly is complex because they have both physical and mental challenges. Some cannot hear well, and others have 'cognitive decline,' which means their brains are not working as fast as they used to. You have to change how you work for every single person."(Student 7).*

*"...Memory problems and general confusion are very common. Sometimes a patient doesn't remember who I am or why I am there. This makes communication much more difficult because I have to explain the same things over and over again."(Student 9).*

*"...We see a lot of memory issues, like dementia. When a patient is confused, they might get scared or upset easily. It is hard to provide medical care when the patient cannot remember what is happening to them or where they are." (Student 10).*

Caring for patients with cognitive impairments like dementia requires constant repetition and the use of non-verbal cues to manage frequent disorientation and fear. Students found that adapting to these mental challenges is a demanding process that necessitates specialized simulation training to improve patience and clinical outcomes.

**Strategies used to overcome language barriers.** Students utilized various coping strategies, including non-verbal communication, translation tools, peer support, and simplified language. While these approaches helped facilitate basic interactions, they were often insufficient for complex clinical communication. The use of digital translation tools has been explored in healthcare settings, although concerns remain regarding accuracy and patient safety [38].

Students used gestures, peer translation, simplified explanations, written aids.

*"...We don't work alone. When the language is too difficult, we ask the local nurses or our mentors for help. Working together with the native staff is the best way to make sure the patient understands the medical plan." (Student 6).*

*"...If words don't work, we use 'non-verbal' communication. This means we use our facial expressions, hand gestures, and body language to show what we mean. Sometimes a gentle touch on the shoulder helps the patient feel calm even if they don't understand our words." (Student 11).*

*"...We try to keep everything very simple. We speak slowly and use very basic words. We also use 'visual aids, like pointing to pictures or objects, to explain a procedure. We try to learn 'small words' for things like 'pain' or 'water' to make daily care easier." (Student 9).*

*"...When we cannot understand each other, we use technology like Google Translate on our phones. It helps us translate words quickly. Sometimes we even try to learn and write down new words in the local language, like Lithuanian, so we can use them later with the patients." (Student 1).*

To overcome language barriers, students utilized a combination of non-verbal cues, such as hand gestures and facial expressions, alongside digital tools like translation apps to facilitate immediate understanding. They also relied heavily on "peer translation" from local staff and the use of simplified vocabulary or visual aids to ensure patient safety and comfort during daily care.

**Emotional impacts of language related communication difficulties.** The missteps led to self-doubt which developed into general stress and avoidance. Individual strength was used to cope. This could be overcome through wellness programs. Miscommunication not only affected patient safety but also contributed to avoidance behaviours and professional self-doubt [39, 40]. Participants were under the influence of stress, fear of failure, frustration, and lack of confidence.

*"...It is very draining for my emotions. When a patient is angry or sad, I don't know how to control the situation, so I often try to avoid it. I have to remind myself not to take their anger personally, but it still feels very heavy to carry every day." (Student 10).*

*"...When I cannot communicate well, I start to doubt my own abilities. It makes me feel like I am not a good student. Even the patients notice it-if I can't speak to them, they don't feel confident in me either. It's hard to help someone who doesn't trust you because of a language gap." (Student 3).*

*"...There are moments that make me feel really bad and upset. In the beginning, we used to get very emotional about these struggles. But we realized that we cannot stop. Even if we are upset, we still have to go to the ward and do our job for the patients." (Student 5 ).*

*"...Miscommunication is dangerous. It leads to misunderstandings that can hurt the patient's safety and comfort. When I am stressed and frustrated because I can't explain things, I start to make more mistakes. It's a scary feeling because I want the patient to be safe." (Student 9).*

Language barriers create a heavy emotional burden for students, leading to persistent self-doubt, frustration, and a "scary" fear that miscommunication might compromise patient safety. To cope with the resulting stress and patient mistrust, students often resort to avoidance or forced emotional detachment to remain functional on the ward.

### Formal and informal support systems in geriatric practice

Formal and informal networks were of different assistance, whether in practical advice or emotional support. Unmet needs in struc-

ture were brought to light through inconsistencies. This finding highlights the needs for integrated formal and informal support systems.

**Support from clinical supervisor and mentors.** The Clinical Supervisor and Mentors must offer support, particularly with choosing the subjects for research projects and conducting the research process itself. Practical corrections were skill-building, whereas the mismatch of the languages diminished access. Tolerant methods led to trust. Consistent mentorship approaches helped standardize student learning experience [41]. These findings support the need for standardized mentorship should be standardized rather than dependent on individual attitudes.

Participants (mixed experiences) described guidance, instruction, constructive feedback, and supervision.

*"...My mentor is the most important person for my learning. They stay with me, show me the correct way to do procedures, and give me feedback. If I make a mistake, they correct me kindly. They provide a lot of detail so I can understand the medical work better."(Student 2).*

*"...Mentors are very supportive when there is a language barrier. Some amazing mentors will talk to the patient for me or translate what the patient is saying. They also teach me how to work as a team and how to ask the patient for permission before I start my work. It makes me feel much safer."(Student 3).*

*"...My supervisor helps me build a relationship with the patients. Sometimes, the patient is nervous, but the mentor convinces them that I am capable of doing the procedure. Some mentors even give me a written 'draft' or list of all the patients so I know exactly what to do for each person." (Student 6).*

*"...Not every experience is perfect. Some mentors are very kind and always there to help, but others can be rude. Sometimes, the mentors who speak the local language don't help us or they 'corner' us, which feels very uncomfortable. When a mentor has a bad attitude, it makes it very difficult for us to do our work."(Student 5).*

Clinical learning is facilitated mostly by effective mentorship and supportive supervisors assist in providing necessary technical feedback, draft patient list, and linguistic mediation that protects the safety of the students. Nevertheless, the student experience is not uniform; whereas a positive attitude towards students by kind mentors leads to student-patient trust, bad attitude-based, or excluding behaviours by mentors lead to an unpleasant environment that greatly impacts professional development.

**Peer support among international nursing students.** Sharing of troubles was facilitated by exchanging tips, which enhanced cohesion. This strengthened functional coping. The mutual aid could increase by formal groups [42]. It was reported that participants shared experiences, gave advice, provided emotional support, and worked together.

*"...My friends are a big help to me. During our practice, we find time to talk to each other about what is happening. We give each other advice and tips on how to handle the work. It is much easier when you can talk to someone who is doing the same job as you." (Student 2).*

*"...My friends are the ones who encourage me when I feel down. They motivate me to keep trying, even when the day is difficult. Sometimes, they even ask me to help them with practical tasks, which helps us both learn and feel more confident in the hospital." (Student 3).*

*"...I like to discuss my daily situations with my friends. We share what happened with our patients and how we reacted. When I hear their stories, I don't feel so alone. Sharing our different experiences helps us understand the hospital environment much better." (Student 8).*

*"...Sharing my experiences with friends who are also working in the hospital really helps my stress. We are all going through the same emotional journey. When I have a hard day, I talk to them, and they understand me in a way that people outside the hospital cannot." (Student 10).*

Peer support serves as an essential coping strategy where international students get a secure platform to share viable clinical advice and emotional support. The students lessen

their isolation since they are able to share their "daily situations" thereby developing a special support network which can alleviate the pressure of the hospital setting.

**Family and social support outside the clinical environment.** Family support helped students cope with stress and reinterpret difficult experience. This provided remote encouragement. Digital communication strengthened ongoing emotional support from family members [43]. The use of personal analogies, such as treating patients like family members, strengthened empathy and emotional resilience. Participants were motivated, emotionally reassured, stress-managed, and to be in touch virtually.

*".....My family is my biggest support. When I am stressed, they tell me: 'It's okay, just try to look at the patients like they are your own grandparents'. This advice changes how I feel. If I imagine the patient is my own grandpa or grandma, I find more patience and love to give them, even when it is hard." (Student 1).*

*"...My family is always there to hear me out. After a long shift, I go home and tell them everything. They encourage me by reminding me of our own family elders. It helps me stay calm because I start to treat the patients with the same respect I have for my own relatives." (Student 11).*

*"...Family and friends provide the emotional encouragement I need to keep going. They give me the motivation to return to the hospital the next day. When I feel like I cannot do it anymore, their kind words help me find my strength again." (Student 7).*

*"....It is so important to have our loved ones there to shale our situations. My family tells me, 'Imagine you are treating me.' This makes the work feel more personal and less like just a job. It reminds me that every elderly patient is someone's mother, father, or grandparent." (Student 8).*

The external social and family networks are important emotional buffer that offers the international students resilience they require to go back to demanding clinical settings. Families can make stressful clinical activities meaningful and caregiving by promoting humanization of their patients by encouraging them to treat them like their own grandparents through the use of personal analogies.

**Perceived gaps in available support systems.** Language and mentorship improvement requests were indicators of failure in institutions. This called upon system improvements. Addressing these gaps could improve students preparedness and clinical performance [33, 44]. Participants expressed the need to receive language training, cultural orientation, structured mentorship, as well as, to gain extra resources.

*"...The university should offer free Lithuanian language classes for all students. We specifically need to learn 'medical terminology' so we can understand the words used in the hospital. If we reach a B2 level in the language, our work will be much easier and safer." (Student 1).*

*"...We need more language support before we start our practice. If we have more training, our communication will improve. We also need help with 'emotional communication' so we know how to talk to patients who are sad or angry. More guidance in these areas would help us a lot." (Student 9).*

*"...It would be very helpful to have 'cultural orientation' programs. This helps us understand the local traditions of the elderly. Also, the language classes should be specific to the hospital. We need to know the exact words for pain, medicine, and procedures before we walk onto the ward."(Student 7).*

*"...I think we can learn a lot by spending more time with our own grandparents at home. Taking care of our own family helps us learn how to be patient and kind. Then, we can use those same skills with the elderly patients at the hospital." (Student 5).*

*"...We need mentors who teach us how to work together as a real team. Instead of showing discrimination or making us feel different, they should support us. A good team environment makes everyone work better and helps the patients get better care." (Student 11)*

Overall, this study highlights that the experience of international nursing students in geriatrics is an experience of high resilience in the presence of systemic and interperson-

al challenges. Although the level of empathy and resourcefulness shown by the students is high, based on the usage of technology and personal analogies to deliver care, the severe language barrier and inconsistencies in mentorship increase clinical risk and emotional burden. The problem of clinical, linguistic and sociocultural barriers indicates the so-called triple burden of clinical, linguistic, and sociocultural barriers, which implies that individual effort will not be sufficient to succeed in becoming a geriatric workforce; instead, an institutional commitment to the program will be necessary. Finally, to bridge the gap between international nursing training and practice in Lithuania, it is necessary to replace the ad hoc student coping strategies with systematic, comprehensive, and language-specific support systems to guarantee the well-being of students as well as patient safety of the aging population.

## Conclusion

The research determines that geriatric care is viewed by international nursing students as a stressful setting where a clinical inexperience, physical load, and ethical challenges are a burdensome triad of pressure factors. Students lack a lot of confidence in carrying out procedures with weak patients, which makes them resort to trial-and-error learning, which results in a high level of anxiety. The language barrier is concluded to be the major barrier to effective and safe care. Linguistic barrier between English-speaking students and the Lithuanian-speaking elderly patients leads to the development of a professional paralysis in which students cannot communicate to determine the medical process, identify the pain levels correctly, and offer emotional support. This obstacle compels students to use non-verbal communication and digital translators that are in most cases not adequate to carry out elaborate clinical work.

In the research, it is established that support systems have a two-fold role in the student experience. Clinical mentor support is greatly appreciated and yet not reliably provided; supportive mentors play a critical role of providing linguistic and technical scaffolding, though unsupportive or discriminative staff members may cause an isolationist effect on the professional environment. The first emotional buffer is informal peer support and family support. The peer connections offer an essential avenue of exchanging practical recommendations and alleviated social solitude, whereas relatives offer the inspirational strength that is required to keep on moving amidst the challenging transitions

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# LIVING ENVIRONMENT OF STUDENTS AND HEALTH COMPLAINTS AT THE LITHUANIAN UNIVERSITY OF HEALTH SCIENCES

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**ABSTRACT. Background and aim.** Medical students often face high rates of health complaints like fatigue, stress, and sleep disturbances, largely driven by intense academic demands. Living environment factors such as noise, privacy, air quality, and room design influence well-being. Most existing studies focus on isolated environmental factors rather than comprehensive patterns of multiple health complaints. **Aim** of this research survey was to improve the understanding on the living environment and the health of the medical students at the Lithuanian University of Health Sciences (LSMU) and to explore the relationship between living environmental and health complaints. **Methods**. Cross-sectional survey involved 200 students of Lithuanian University of Health Sciences (LSMU) studying at integrated degree study programme in Medicine and was conducted in 2025. A self-administered online questionnaire assessed sociodemographic characteristics, 11 living environment factors (5-point Likert scale; composite Living Environment Quality score), 10 health complaints, screen use patterns, and perceived stress. Data analysis in SPSS included descriptive statistics, correlations, and multiple regression. **Results.** Fatigue (82%), stress (78%), and sleep disturbances (65%) emerged as the most prevalent when any frequency above "never" was counted. Females and non-dormitory residents reported higher complaint burdens. Better perceived air quality was modestly associated with lower Total Health Complaints ($r = –0.235$, $p < 0.01$). The strongest predictor of health complaints was eye strain or headaches after prolonged device use ($\beta = 0.37$, $p < 0.001$), followed by average daily screen time ($\beta = 0.20$, $p = 0.002$). **Conclusion**. Suboptimal living environments compound health challenges for LSMU medical students, particularly when combined with excessive screen use. University interventions targeting dormitory ventilation, noise reduction, and privacy could meaningfully enhance student well-being and academic performance.

**Key words:** medical students, living environment, health complaints, sleep disturbances, stress.

## Introduction

The mental and physical well-being of students studying in the field of medicine is a growing global concern [1, 2]. A report indicated that professional medical students suffer the most from various health complaints which are more than the general public and other students [3]. One major reason for this high prevalence illness is the combination of too much academic pressure for which students have to work very hard and the intensive profile of medical courses which are very stressful and demanding [3]. Research has demonstrated that medical students are significantly affected by sleep disturbances [1], fatigue [4], headaches [4], anxiety [4, 5], and stress [4, 5]. The lasting effects of stress, anxiety, sleeplessness, and other health problems which can in series lead to the reduction in cognitive functions, and also to the loss of a normal concentration of one's academic success [3]. These complaints raise concerns not only about students' current quality of life, but also about their future academic performance, professional development, and quality of patient care [3]. Identifying and addressing

these difficulties is therefore very crucial for supporting medical students' health and academic success [3]. The high number of complaints is very obviously justified by the need to carry out a full-scale study to detect and solve the risk factors, create corresponding preventive measures and provide relevant support services to the population [3]. The physical and social conditions of student housing may therefore be an important part of the broader picture of student health. Poor housing conditions and dormitory environments have been associated with sleep problems, stress, anxiety, and other health outcomes among university and medical students, but much of the existing evidence comes from studies in other countries, focuses on single environmental factors, or mainly examines sleep rather than the broader pattern of health complaints [56].

General aim of this research survey was to improve the understanding on the living environment and the health of the medical students at the Lithuanian University of Health Sciences (LSMU). This study also aimed to explore the relationship between living environmental and health complaints and providing valuable insights for the university and contributing to the broader understanding of student health in such academic settings.

## Methods

**General design of the study.** This work was based on a crosssectional observational study carried out among medical students at LSMU. The study population eligible for participation consisted of all students enrolled in the sixyear Integrated Degree Medical Doctor (MD) Study Programme (approximately 1200 students across first to sixth year) at LSMU in 2025. An invitation to participate in the study was sent via institutional email to the full MD student population. Participation was voluntary and open to all students who met the inclusion criteria [enrolled in the MD programme during the study year and aged 18 years or older]. Those who did not consent were excluded. In total, 200 students submitted fully complete questionnaires and formed the final analytical sample. Questionnaires with missing data on key outcome variables or with obvious inattentive response patterns were excluded. Data were collected using a selfadministered online questionnaire with 48 items, hosted on the Google Forms platform.

**The instrument applied and variables.** The questionnaire form was organized into six sections: sociodemographic information, living environment assessment, health complaints, perceived stress and impact to living environment, technology use. Before the main survey, the draft questionnaire was piloted with approximately ten medical students to check face validity, clarity, length, and technical functioning. Based on their feedback, wording of a few items was refined, but the overall structure and content remained unchanged. Data were exported from Google Forms into Microsoft Excel and then into IBM SPSS Statistics (version 30.0) for analysis. Prior to analysis, data were screened for completeness and plausibility, and composite scores (LEQ, Total Health Complaints, PSS10) were calculated according to predefined rules. Reversecoded items in the PSS10 were recoded before summation.

**Statistical methods.** Descriptive statistics were used to characterize the sample and core variables: frequencies and percentages for categorical variables, and means with standard deviations for continuous variables. Normality of continuous variables was assessed using the Shapiro–Wilk test and inspection of histograms and Q–Q plots; although formal tests often indicated minor deviations from normality, distributions were approximately symmetric and without extreme outliers, and parametric methods were judged appropriate given the sample size. Bivariate relationships between continuous variables were examined using Pearson correlation coefficients. Group differences in continuous outcomes were tested using independentsamples ttests and oneway ANOVA. To identify independent predictors of the Total Health Complaints score, a multiple linear regression model was constructed. Differences were considered as statisticaly significant by calculating $p < 0.05$.

**Bioethical approval** for this study was obtained from the Bioethics Centre of the Lithuanian University of Health Sciences before the survey.

**Results**

This cross-sectional questionnaire survey included 200 medical students from LSMU. Female students formed the majority of the sample (60%, n = 120), while male students represented a significant minority [39.5%, N = 79. Most participants were Lithuanian nationals (85.5%, n = 161), though international students were also meaningfully represented. Students from all six years of medical school took part, with larger rep Students rated how often they experienced various health complaints, using a scale from "never" to "very often." The results showed a clear pattern: psychological complaints dominated the list. Stress emerged as the most frequently reported complaint, affecting the vast majority of students on a regular basis.

Looking at health complaints individually is informative, but assessment of the overall health burden gives a better sense of students' wellbeing. When all complaints were combined into a composite score, the average level fell between "sometimes" and "often" for experiencing health problems, as presented in Table 2. The considerable variation in these scores indicates that some students had relatively few complaints while others struggled with multiple health problems at once. The perceived stress measure (PSS-10) was adapted to match the rest of the questionnaire format.

**Table 1.** Descriptive Statistics of Individual Health Complaints reported by students (n = 200)

| Health Complaint | Mean | SD | Min | Max | Answers: Often / Very Often, % |
|---|---|---|---|---|---|
| Feeling stressed | 3.71 | 0.907 | 1 | 5 | 64.5 |
| Feeling anxious | 3.50 | 1.032 | 1 | 5 | 59.0 |
| Difficulty concentrating | 3.24 | 0.927 | 1 | 5 | 47.5 |
| Waking up unrefreshed | 3.17 | 1.108 | 1 | 5 | 39.5 |
| Fatigue | 3.07 | 1.089 | 1 | 5 | 35.5 |
| Eye strain | 3.05 | 1.131 | 1 | 5 | 33.5 |
| Trouble falling asleep | 2.92 | 1.074 | 1 | 5 | 30.0 |
| Headaches | 2.84 | 1.034 | 1 | 5 | 24.5 |
| Muscle tension | 2.65 | 1.089 | 1 | 5 | 16.0 |
| Trouble staying asleep | 2.57 | 1.096 | 1 | 5 | 14.0 |

*Note: Scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often.*

**Table 2.** Summary Statistics for Health Outcome Measures (n=200)

| Measure | Mean | SD | Min | Max | Range |
|---|---|---|---|---|---|
| Total Health Complaints | 30.69 | 6.71 | 12 | 50 | 10–50 |
| PSS-10 (Perceived Stress)* | 30.73 | 5.62 | 11 | 44 | 10–50 |

**Note: PSS-10 scored on 1–5 Likert scale (range 10–50) rather than standard 0–4 scale (range 0–40) to maintain consistency with overall questionnaire format.*

Previous research suggests that men and women may exhibit different patterns of health complaints during medical training, so examining gender differences can help target support more effectively. Overall health complaint scores showed no significant gender differences.

Each year of medical school presents distinct challenges. Early years involve adjusting to university life and intense coursework, while later years add clinical duties and career planning- related pressures. Understanding whether health complaints vary by year could identify periods of students needing particu-

lar support. Overall health complaint scores did not differ significantly across the six years. However, meaningful year-specific patterns emerged when examining specific complaints. Third-year students reported notably less anxiety compared to first and sixth-year students. In contrast, sixth-year students facing graduation and career decisions demonstrated elevated levels of distress across several domains. Stress, fatigue, and sleep- related problems were particularly pronounced among this group, with unrefreshing sleep being reported more often than among students in earlier years.

International students face unique challenges beyond the normal stresses of medical school, including cultural adjustment, potential language barriers, separation from family, and reduced social support. These factors could intensify the existing academic demands of medical training.

International students reported significantly higher fatigue than Lithuanian students, as presented in Table 3 showing a statistically significant and practically important difference. They also had more trouble falling asleep. However, stress and anxiety levels were similar between the two groups, suggesting that the core psychological burden of medical education affects all students equally regardless of their nationality. The greater fatigue and sleep initiation difficulties seen in international students, likely reflect the added cognitive and emotional strain of studying medicine in a non-native language while adapting to a new cultural environment and managing separation from home.

Students' living situations could potentially influence their health through various differences in environmental quality, privacy, social support, and daily stressors, all of which vary between living situations. Dormitories, shared apartments, private apartments, and family homes each present different advantages and challenges. Despite these differences, total health complaints did not differ significantly across living arrangements. LSMU medical students experience a substantial and multidimensional health burden, dominated by psychological distress and sleep problems.

Stress and anxiety are endemic, affecting nearly all students regularly, placing students at stress levels comparable to those observed in clinical populations. Female students struggle more with anxiety, sleep maintenance issues, and fatigue than their male counterparts. International students report experiencing significantly greater fatigue despite similar levels of stress and anxiety, suggesting that language and cultural adaptation contribute to physical exhaustion.

Students perceive their living environment matters and these perceptions can reflect and influence well-being, comfort, and academic performance. A student who feels that their living space is poor and inadequate may experience stress. We examine students' subjective evaluations of specific housing aspects to identify the most problematic domains and to determine which student groups face the least favorable conditions. Students rated eleven different aspects of their living environment on a scale ranging from "very poor" to "excellent."

Air quality received the most positive ratings overall, with few students expressing dissatisfaction about it. This suggests that ventilation and indoor air condition are generally acceptable across most student housing. Artificial lighting was also rated relatively well, though more students reported concerns here than with air quality. Several other factors, however, showed widespread dissatisfaction. Natural light topped as the biggest problem and was the only factor averaging below "fair" on the rating scale. A notable pro-

**Table 3.** Nationality Differences in Health Complaints: Independent-samples t-tests, df = 196

| Complaint | Lithuanian (n = 161), M±SD | International (n = 37), M±SD | t | p | Cohen's d |
|---|---|---|---|---|---|
| Fatigue | 2.94±1.07 | 3.59±1.04 | -3.382 | <0.001** | -0.617 |

portion of students rated natural light poorly, indicating that many students live in spaces with insufficient daylight exposure.

Room size was another major concern, with a large share of students rating their space as inadequate and only a small minority expressing satisfaction with it. Privacy troubled more than a third of students, as did inadequate study space and uncomfortable furniture.

Temperature control, cleanliness, and both indoor and outdoor noise all followed similar patterns with substantial minorities reporting dissatisfaction across these domains. Examining whether men and women experience similar living conditions is important, the analysis revealed pronounced and consistent disparities, as detailed in Table 4. Male students rated nearly every environmental factor significantly lower than female students. This could reflect systematic differences in the quality of facilities allocated to each gender, differences in the types of housing typically chosen by male and female students, or possibly different standards and expectations. Regardless of the causes, the findings raise important concerns from an equity perspective in student housing.

Students in different years of study may encounter different environmental conditions for several reasons. Institutions sometimes may allocate housing based on seniority, senior students may have greater financial resources for better private housing, or their priorities and expectations may shift as students' progress through medical school. The statistical analysis found highly significant differences across academic years for all measured environmental factors, as presented in Table 5. The pattern

**Table 4.** Gender Differences in Environmental Satisfaction: independent-samples t-tests, df = 197

| Environmental Factor | Male (n = 79), M±SD | Female (n = 120), M±SD | t | p | Cohen's d |
|---|---|---|---|---|---|
| Cleanliness | 2.71±1.21 | 3.65±1.19 | -5.414 | <0.001 | -0.784 |
| Study space | 2.73±1.14 | 3.53±1.32 | -4.416 | <0.001 | -0.640 |
| Furniture comfort | 2.61±1.07 | 3.39±1.29 | -4.480 | <0.001 | -0.649 |
| Room size | 2.43±1.41 | 3.44±1.47 | -4.821 | <0.001 | -0.698 |
| Privacy | 2.51±1.55 | 3.53±1.60 | -4.450 | <0.001 | -0.645 |
| Natural light | 2.42±1.48 | 3.27±1.38 | -4.119 | <0.001 | -0.597 |
| Artificial light | 3.05±1.15 | 3.83±1.16 | -4.625 | <0.001 | -0.670 |
| Temperature control | 2.71±1.00 | 3.36±1.19 | -4.012 | <0.001 | -0.581 |
| Indoor noise | 3.08±0.97 | 3.48±1.10 | -2.676 | 0.008 | -0.388 |
| Air quality | 3.63±0.87 | 3.70±1.03 | -0.480 | 0.632 | -0.070 |
| Outdoor noise | 3.18±1.00 | 3.35±1.19 | -1.065 | 0.288 | -0.154 |

**Table 5.** Environmental Factor Ratings by Year of Study: One-way ANOVA

| Environmental Factor | 1st | 2nd | 3rd | 4th | 5th | 6th | F(5,194) | p | $\eta^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Cleanliness | 3.02 | 3.31 | 2.74 | 3.08 | 4.15 | 3.81 | 5.511 | <0.001 | 0.124 |
| Artificial light | 3.43 | 3.33 | 2.85 | 3.58 | 4.19 | 4.33 | 6.656 | <0.001 | 0.146 |

suggests the possibility of housing allocation based on seniority. Senior students appeared to have access to better housing conditions than younger students

Understanding whether and how living environment influence health complaints is important, because it identifies potentially modifiable risk factors. This section examines both correlational and predictive relationships between environmental conditions and health complaints, while also evaluating technology use as a potentially important pathway linking environment to health outcomes. Correlation analysis was conducted to explore whether better environmental conditions were associated with fewer reported health complaints, as shown in Table 6.

Multiple linear regression analysis was conducted to identify which factors independently predicted health complaints when controlling for other variables, as detailed in Table 7.

This approach distinguishes simple associations from factors that retain predictive power in a multivariate model. The regression model successfully predicted a meaningful proportion of health complaint variance, indicating that the included predictors account for a substantial but not complete portion of health outcomes. Technology-related factors proved to be stronger predictors than environmental factors. Eye strain and headaches from device use were the strongest independent predictors.

Average daily screen time ranked as the second strongest predictor. Increased daily device exposure independently predicted higher health complaints, suggesting that cumulative screen use has health implications beyond acute visual discomfort. This association remained significant even after accounting for pre-sleep device use and environmental factors. Air quality-maintained significance as an independent predictor in the

**Table 6.** Sleep Problems and Environmental Factors with Health Complaints: results of Pearson Correlation analysis

| Variable | Correlation with Total Health Complaints | Sig. (2-tailed) | N | $r^2$ |
|---|---|---|---|---|
| Sleep Problems Total Score* | 0.866** | <0.001 | 200 | 0.750 |
| Eye strain from devices | 0.540** | <0.001 | 200 | 0.292 |
| Air quality | -0.235** | <0.001 | 200 | 0.055 |
| Living Environment Quality (composite) | -0.067 | 0.344 | 200 | 0.004 |

*Note: *Sleep Problems Total Score = composite of three sleep-related items (trouble falling asleep, trouble staying asleep, waking up unrefreshed).*

**Table 7.** Multiple Linear Regression: Predictors of Health Complaints

| Predictor | B | SE(B) | β | t | p |
|---|---|---|---|---|---|
| Constant | 20.246 | 3.696 | – | 5.478 | <0.001** |
| Eye strain/headaches (device) | 2.846 | 0.500 | 0.368 | 5.695 | <0.001** |
| Average daily screen time | 2.148 | 0.678 | 0.201 | 3.167 | 0.002** |
| Air quality rating | -0.938 | 0.444 | -.0134 | -2.112 | 0.036* |
| Pre-sleep device use | 0.197 | 2.016 | 0.006 | 0.098 | 0.922 |

multivariate model, although its effect was smaller than that of the technology-related factors.

Better ratings of air quality were associated with fewer health complaints. This provides evidence that at least one environmental condition influences health independently, even when behavioral factors like screen time are accounted for. Statistical diagnostics confirmed the regression model met standard assumptions, and multicollinearity tests confirmed predictor variables measured distinct constructs without excessive overlap.

**Discussion**

This cross-sectional study examined living environmental situation and the relationship between living environment factors and common health complaints among 200 medical students at LSMU. Our findings contribute to the growing number of works documenting the considerable health burden experienced by medical students globally. Understanding these correlations is essential for developing targeted interventions to support student well-being during this demanding phase of professional development.

Feeling stressed emerged as the most prevalent complaint among students, with a mean score of 3.71 on a 1 to 5 scale, indicating that stress was generally experienced between “sometimes” and “often.” The high stress levels observed in this study are consistent with findings from international research based on medical students [1,6,7]. However, the prevalence reported in this sample, 64.5%, is notably higher than the 25% to 45% range described in Azad et al.’s global systematic review, suggesting that LSMU students may be experiencing more pressure than many of their peers [3]. This difference may reflect local academic conditions, the structure of medical training, or contextual pressures not fully captured by broad international comparisons. Earlier studies have shown that medical students commonly experience sleep disturbances, fatigue, headaches, anxiety, and stress, and when these complaints persist, they can impair concentration and cognitive functioning, thereby affecting academic performance [1, 3–5]. At the same time, these results should be interpreted cautiously, as the cross-sectional design does not allow us to determine whether high stress levels are driven primarily by medical training itself [1, 4], by broader societal or economic pressures [7, 8], or by individual vulnerability factors [9]. Survey bias is also possible where students under greater strain were either more motivated to participate in the survey or, conversely, less likely to respond, which could affect the observed estimates in either direction [3, 7, 8, 10]. The link between stress, anxiety, and health complaints is well established in literature. Chronic stress can disrupt neuroendocrine regulation and affect brain systems involved in concentration and memory [1, 3, 5], while anxiety may further reduce attentional capacity through persistent worry and rumination. Together, these processes help explain why students with high psychological burden often report difficulty concentrating and poorer academic functioning [11].

Sleep disturbances were a major concern in this study. The pattern observed in this sample is consistent with other literature showing that sleep problems are more common among medical students than among non-medical students and the general population [3, 12]. Previous reviews have linked this to heavy academic workload, irregular schedules, and high stress levels [3]. Sleep disruption among students has also been linked to evening use of blue light-emitting devices such as smartphones, tablets, and laptops. In Janiene et al. study, nearly all respondents used electronic devices before bedtime, and a substantial minority reported poor sleep quality [13]. Azad et al. argued that these findings support the need for general sleep education and targeted interventions for students at risk of sleep problems [3].

The demanding nature of medical training may also contribute to burnout-related fatigue. Burnout symptoms such as emotional exhaustion and depersonalization have been reported in medical students [15], and female students have often shown more vulnerability in this area [15]. Sleep-related problems represent a major component of overall health

complaints in this sample. Sleep problems total score [composite of trouble falling asleep, trouble staying asleep, and waking up unrefreshed] was strongly, and positively correlated with total health complaints.

Multiple linear regression was used to examine environmental factors and technology use as predictors of total health complaints. The model was statistically significant and explained about one-quarter of the variance in health complaints. Eye strain/headaches from device use emerged as the strongest independent predictor of health complaints. Each single unit increase on the eye strain scale predicts 2.846 additional health complaint points. This result is notable because device-related discomfort was linked to an elevated health burden even after controlling for total screen time and environmental factors. The mechanisms are well described, with prolonged near-work creating accommodation strain, convergence load, and visual system fatigue, with blue light exposure disrupting circadian rhythm and melatonin production [9,13]. Pre-sleep device use did not emerge as a statistically significant predictor of health complaints, despite its very high prevalence of 95.5%. This likely reflects the limited variability in this behavior, which reduces the statistical power, to detect effects, or suggests that the impact of pre-sleep device use operates primarily through stress-related or other indirect pathways rather than direct, independent mechanisms. This critical finding indicates that perceived stress, already identified as the most prevalent health complaint, with the central role, likely plays a larger independent role in determining health outcomes than specific environmental or technology factors.

Overall, the pattern of results indicates that perceived stress is the main determinant of overall health burden among medical students. This interpretation is consistent with international literature documenting that the inherent stressors of medical education and its demanding curriculum, clinical training pressures, career uncertainties, represent primary sources of health burden [1,3,7,8,10,16]. Taken together, the findings of this study collectively support a multifactorial model of medical student health in which health complaints arise from interactions among multiple determinants like environmental, behavioral, and individual factors.

**Strengths and limitations** This study possesses several important strengths. The integration of environmental and behavioral predictors in multivariable analyses offers a broader explanatory model than studies examining factors in isolation. The examination of demographic variations provides important descriptive information about health and housing inequities. The documentation of substantial environmental quality differences across living arrangements and demographic groups provides concrete evidence potentially motivating institutional actions.

Some limitations of study could be mentioned: The relatively small sample size (n = 200) provides less power to detect moderate effects and examine multiple demographic subgroups with reasonable precision. Relatively small number of student male respondents also does not allow to make a valid statement on gender variations. The cross-sectional design does not include causal conclusions. Observed relationships may reflect causal effects, reverse causation, or confounding. Reliance on self-reported measures introduces potential bias. Perceived environmental quality potentially may not fully match objective conditions, and health complaints may be potentially influenced by response styles or psychological factors. The lack of objective environmental measurements represents another important limitation. While subjective perceptions have validity as representations of lived experience, objective assessments of environment dimensions would help distinguish between perceptual and physical environmental effects.

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# THE ROLE OF PERSONALITY TRAITS AND PROBLEMATIC INTERNET USE IN SUBJECTIVE SLEEP QUALITY AMONG FIRST-YEAR STUDENTS

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**ABSTRACT. Background and aim.** Internet-based technologies have become an integral component of contemporary society, shaping a wide range of activities, including interpersonal communication, professional and academic work, leisure, and access to information and services. **The aim** of this study was to examine the relationship between personality traits, problematic internet use (PIU) and sleep quality among first-year bachelor university students. **Methods.** A cross-sectional study of 437 university students from three universities in Kaunas, Lithuania was carried out. Data were collected on-line during October and November 2025. Problematic internet use was assessed using special instrument – Problematic Internet Use Questionnaire (PIUQ-9). For evaluation of personality traits, the Ten-Item Personality Inventory (TIPI) was applied. The sleeping quality was assessed by using the Pittsburgh Sleep Quality Index (PSQI). Statistical analysis included descriptive statistics, group comparisons, correlations, linear regression, and mediational analysis. **Results.** The mean score of PIU was 21.65±6.3. Women reported higher PUI scores than men (22.57±6.3 *vs* 19.85±5.8; $p < 0.001$). Poor sleep quality (PSQI > 5) was reported by 74.4% of participants; women had poorer sleep quality than men (7.83±2.9 *vs* 6.85±2.7; $p < 0.001$). Low conscientiousness and emotional stability predict high PIU. High levels of agreeableness ($r = -0.133$; $p = 0.005$), emotional stability ($r = -0.284$; $p < 0.001$) and openness ($r = -0.105$; $p = 0.028$) were related to better sleep quality, however only emotional stability was a predictive factor ($\beta = -0.599$; $p < 0.001$). Students with higher PIU had poorer sleep quality ($r = 0.268$; $p < 0.001$). Emotional stability directly ($c' = -0.521$, $p < 0.001$) and indirectly through PIU ($ab = -0.120$; 95% CI [-0.194, -0.058]) influences sleep quality. **Conclusions:** 13.6% of first year university students exhibit the high risk of problem internet use (PIU). Female students were more susceptible and showed higher PIU risk scores. Female students demonstrated a significantly poorer sleep quality than male students. High levels of agreeableness, emotional stability and openness are related to better sleep quality, however only emotional stability is a predictive factor of good sleep quality. Students who have higher PIU exhibit poorer sleep quality. Emotional stability directly and indirectly through PIU influences sleep quality. Even though PIU plays an important role in the relationship between emotional stability and sleep quality, it only partly explains the relation between emotional stability and sleep quality.

**Key words:** university students, problematic internet use, personality traits, sleep quality.

## Introduction

Smart technologies are increasingly being integrated into diverse domains of everyday life. Internet-based technologies have become an integral component of contemporary society, shaping a wide range of activities, including interpersonal communication, professional and academic work, leisure, and access to information and services. According to recent data 6.04 billion people were internet users and that is 73.2% of the world's population [1]. Even though the internet provides a lot of opportunities to do, see or find out what otherwise would be very hard to do and

would require enormous amounts of resources, it does have also negative consequences. Huge amounts of information make it harder to find the truth and cyberbullying is a growing problem worldwide [2]. Excessive internet use can become a problem and have a negative impact on many areas of life. Problematic Internet Use (PIU) is described as not being able to control time spent on the internet and negative outcomes on psychological wellbeing and social, professional, academic difficulties that arise from it [3]. According to latest data PIU prevalence in different regions varies from 20% to 44.6% [4]. Meta-analyses show that PIU is related to symptoms of depression, anxiety, loneliness, other psychological disorders and poorer sleep quality [4].

Sleep is one of the most important human needs for daily functioning, psychological and physical health. A good night's sleep is needed for rest, emotional regulation, self-regulation and executive functions [5]. However, due to the ever-accelerating pace of life and increasing demands, sleep is being cut short in order to make more time for other activities. The health restorative function of sleep is one of the most important [6]. High-quality sleep of sufficient duration helps restore balance at the neurochemical, hormonal, muscular and immunological levels [7]. This balance has an immense effect on everyday functioning. One notable finding in this area is that sleep and self-regulation are bidirectionally related [8], while self-regulation is also influenced by personality traits such as neuroticism and externalizing behaviours [9].

There are several factors that influence human behaviour, one is personality. Personality traits depends on a person's behaviours and decision-making patterns. Personality traits may influence individuals' behavioural tendencies, including their propensity to engage in maladaptive behaviours, respond negatively to challenging situations, or adopt more positive and adaptive patterns of responding. Since PIU is considered to be a behavioural problem, personality traits may influence whether and to what extent it develops into a problematic pattern of internet use. One study showed that all the Big Five personality traits are related to PIU [10]. Furthermore, evidence also suggests that sleep quality may be associated with personality traits and that certain personality traits may increase the likelihood of developing PIU. Guerreiro et al. [11] reported associations between personality traits and various aspects of sleep. Neuroticism was associated with overall sleep quality, while conscientiousness was associated with a morning chronotype. Other sleep-related factors linked to personality traits included sleep duration, nightmare frequency, sleep deprivation, sleep continuity, insomnia and sleep disturbances, sleep hygiene, sleep onset latency, and daytime sleepiness. Based on these findings, it can be suggested that personality traits may influence individuals' health-related behavioural choices. Therefore, examining the relationships between personality traits, problematic internet use (PIU), and sleep quality is of particular importance.

**The aim** of this study was to examine the relationship between personality traits, problematic internet use (PIU) and sleep quality among first-year bachelor university students.

## Methods

A cross-sectional study was conducted among university bachelor students from three universities in Kaunas. It was carried out after approval of Lithuanian Bioethics Centre Committee of Lithuanian University of Health Sciences (approval Nr.2025.BEC2-0864). Data were collected in during period from October 22 to November 25 in 2025.

Respondents filled in questionnaire forms during and between students' classes at their respective universities. Participants were provided with a QR code that directed them to the online questionnaire. First-year bachelor students from three universities in Kaunas, Lithuania, representing diverse fields of study, including technology, health sciences, and social sciences, were invited to participate. Eligibility required participants to be able to read and write in Lithuanian.

The survey questionnaire covered several investigation domains including demographic characteristics of students and special parts devoted to tree areas in focus: 1) Problematic

Internet Use questionnaire (PIU-9) for internet use (higher score means greater risk; ≥ 29 means high risk) [3], 2) Pittsburgh Sleep quality Index (PSQI) for sleep quality (>5 is considered poor sleep quality) [12] and 3) Ten Item Personality Inventory (TIPI) for the Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, emotional stability) [13].

Descriptive statistics were used to analyse data. Pearson's correlation, Student t test, ANOVA, multivariate linear regression and mediation analyses were applied to further infer the data. The IBM SPSS Statistics 31 was used for the statistical analysis.

## Results

437 students participated in the study – 65.9% of them were female and 34.1% – male respondents. The average age was 19.24±1.6. Students of 13 different bachelor's degree programs were included.

**Problematic Internet Use.** The mean score of PIU was 21.65±6.3, 60.2% (PIN > 20) and 13.6% (PIN > 29, as a high risk score) of respondents were high risk internet users. Female students scored on PIU significantly higher than males (22.57±6.3 *vs* 19.85±5.8), p<0,001.

Age had a weak negative, but significant correlation with PIU (r = -0.126, p = 0.008). That means that younger age was associated with higher PIU scores.

ANOVA analysis was conducted to analyse the differences in PIU scores between fields of study (Table 1). The Bonferroni correction revealed that students of health sciences had a significantly higher PIU score than students in the field of technology (p = 0.003, 95% CI [-3.92, -0.65]).

Correlation analyses showed that out of five personality traits only conscientiousness, agreeableness and emotional stability were related to PIU (Table 2). A significant weak negative correlation was established – that means lower agreeableness, conscientiousness and emotional stability were related to higher PIU scores (respectively r = -0.105 p = 0.028; r = -0.202 p ≤ 0.001; r = -0.253 p ≤ 0.001).

A multivariate linear regression model was developed to examine the relationships between personality traits and PIU. The model was statistically significant (F(5.431) = 8.930, p<0.001). The results showed that lower levels of conscientiousness (p = 0.002, β = −0.152) and emotional stability (p < 0.001, β = −0.215) were significantly associated with higher PIU. Emotional stability had the greatest influence (β = −0.215). $R^2$ = 0.094, indicated that personality traits explain 9.4% of the variance in PIU. The adjusted coefficient of determination was 0,083. These data showed that personality traits account only for a small portion of the variance in PIU.

**Sleep Quality Index.** The average Pittsburgh Sleep Quality Index (PSQI) score was 7.5±2.8. 74.4% of the participants scored high-

**Table 1.** Problematic Internet Use (PIU) scores among students of different study fields

| | N | Mean | SD | p |
|---|---|---|---|---|
| Technological Sciences | 151 | 20.41* | 6.2 | 0.004 |
| Social Sciences | 101 | 21.57 | 5.7 | |
| Health Sciences | 185 | 22.69* | 6.3 | |

** p = 0.003.*

**Table 2.** Associations between Problematic internet use (PIU) and personality traits scores.

| | | Extraversion | Agreeableness | Conscientiousness | Emotional stability | Openness |
|---|---|---|---|---|---|---|
| PIU | r | -0.080 | -0.105 | -0.202 | -0.253 | -0.086 |
| | p | 0.094 | **0.028** | **<0.001** | **<0.001** | 0.074 |

er than the threshold of 5, this demonstrates a high prevalence of poor sleep quality between the study participants. Female students demonstrated a significantly poorer sleep quality than male students (7.83±2.9 *vs* 6.85±2.7, $p < 0.001$). Poorer sleep had a weak, but significant association with phone use before sleep (rho = -0.101; $p = 0.034$). ANOVA analyses revealed significant differences in sleep quality between study fields ($F(2.434) = 5.905$, $p = 0.003$). The Bonferroni correction showed that students in the field of technology had better sleep quality than social sciences students ($p = 0.026$, CI [-1.82, -0.08] ) and health sciences students ($p = 0.005$, CI [-1.72, -0.24]).

**Personality traits.** Correlation analyses (Table 4) showed that three of the Big five personality traits were associated with sleep quality: agreeableness ($r = -0.133$; $p = 0.005$), emotional stability ($r = -0.284$; $p < 0.001$) and openness ($r = -0.105$; $p = 0.028$) although weakly, but significantly were related to sleep quality. These data show that higher levels of these personality traits are related to better sleep quality. Table 4 demonstrates the personality trait correlation with PSQI components.

The regression model for association between sleep quality and personality traits was statistically significant ($F(5.431) = 8.891$, $p < 0.001$). Only emotional stability significantly predicted sleep quality ($p < 0.001$, $\beta = -0.266$) – higher emotional stability is associated with better sleep quality. $R^2=0.094$ indicated that personality traits account for 9.4% of the variance in sleep quality and the adjusted coefficient of determination is 0.083.

Study participants with higher PIU scores reported poorer sleep quality ($r = 0.268$; $p < 0.001$). PIU was significantly associated with 4 PSQI components – subjective sleep

**Table 3.** Comparison on Pittsburgh Sleep Quality Index (PSQI) scores among students of different study fields

| | Technological Sciences | Social Sciences | Health Sciences |
|---|---|---|---|
| Mean | 6.86* | 7.81* | 7.84* |
| SD | 2.8 | 2.8 | 2.8 |
| p | 0.003 | | |

**p < 0.05.*

**Table 4.** Associations between personality traits and Pittsburgh Sleep Quality Index (PSQI) scores

| | | Daytime dysfunction | Sleep efficiency | Sleep duration | Sleep latency | Use of sleep medication | Sleep disturbances | Subjective sleep quality |
|---|---|---|---|---|---|---|---|---|
| Extraversion | r | -0.052 | 0.055 | -0.002 | -0.053 | -0.080 | 0.031 | -0.039 |
| | p | 0.280 | 0.255 | 0.975 | 0.265 | 0.093 | 0.519 | 0.412 |
| Agreeableness | r | -0.089 | 0.043 | -0.153 | -0.120 | 0.004 | -0.124 | -0.079 |
| | p | 0.064 | 0.372 | **0.001** | **0.012** | 0.940 | **0.009** | 0.099 |
| Conscientiousness | r | -0.104 | -0.015 | -0.097 | -0.121 | -0.015 | -0.089 | -0.094 |
| | p | **0.030** | 0.753 | **0.043** | **0.011** | 0.754 | 0.062 | **0.048** |
| Emotional stability | r | -0.365 | -0.157 | -0.093 | -0.173 | -0.125 | -0.118 | -0.218 |
| | p | **<0.001** | **<0.001** | 0.053 | **<0.001** | **0.009** | **0.014** | **<0.001** |
| Openness | r | 0.017 | -0.015 | -0.106 | -0.022 | -0.023 | -0.037 | -0.053 |
| | p | 0.728 | 0.753 | **0.026** | 0.649 | 0.626 | 0.446 | 0.270 |

**Table 5.** Associations between Problem Internet Use (PIU) and Pittsburgh Sleep Quality Index (PSQI) scores

| | | Subjective sleep quality | Sleep latency | Sleep duration | Sleep efficiency | Sleep disturbances | Use of sleep medication | Daytime dysfunction |
|---|---|---|---|---|---|---|---|---|
| PIU | r | 0.253 | 0.082 | 0.160 | 0.078 | 0.149 | 0.026 | 0.365 |
| | p | **<0.001** | 0.087 | **<0.001** | 0.104 | **0.002** | 0.587 | **<0.001** |

quality, sleep duration, sleep disturbances and daytime disfunction.

A significant difference in sleep quality was found between those who use smartphones at bedtime and those who don't (respectively 7.63±2.9 *vs* 6.2±2; p < 0.001). The interval of time from stopping to use a smartphone till sleep at bedtime was not associated with sleep quality (p = 0.265). Whether a person used blue light blocking filters or not was not associated with sleep quality (p = 0.877). A significant difference in sleep quality was observed between participants with low and high risk of PIU (respectively 7.35±2.8 *vs* 8.44±2.7; p = 0.005).

A linear regression analysis was conducted to determine the relationship between PIU, personality traits and sleep quality. The model was statistically significant (F(6.430) = 10.830; p < 0.001). PIU (β = 0.204; p < 0.001) and emotional stability (β = -0.222; p < 0.001) emerged as predictive factors. This meant that higher PIU and lower emotional stability predicted poorer sleep quality. The model explained 13.1% of the variance in sleep quality. When gender and whether the person sleeps with a partner were included in the model, the model remained significant (F(8.428) = 9.169, p < 0.001) and explained 14.6% of the variance in sleep quality. This indicated that additional factors did not alter the observed relationship.

Using the PROCESS macro for SPSS [14] a mediation analysis was performed. Based on previous regression, mediation was conducted only with one personality trait – emotional stability. It was established that PIU partly mediates the relationship between emotional stability and sleep quality (Table 6). The analyses showed that emotional stability was associated with PIU (a = -1.260, p < 0.001) and the latter also was associated with sleep quality (b = 0.095, p < 0.001). PIU had a significant mediating effect on the relationship between emotional stability and sleep quality (ab:B = -0.120, 95% CI [-0.194, -0.058]). Furthermore, there was a significant direct relationship between emotional stability and

**Table 6.** Problem Internet Use (PIU) effect on relationship between emotional stability and sleep quality

| Indicator | | M (PIU) | | | | | Y (Sleep quality) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | SP | p | β | | B | SP | p | β |
| X (Emotional stability) | a | -1.260 | 0.230 | <0.001 | -0.254 | c' | -0.521 | 0.105 | 0.001 | -0.231 |
| M (PIU) | | – | – | – | – | b | 0.095 | 0.021 | <0.001 | 0.195 |
| | | $R^2$ = 0.064 | | | | | $R^2$ = 0.122 | | | |
| | | F(1.435) = 29.873, p < 0.001 | | | | | F(2.434) = 30.173, p < 0.001 | | | |

**B – unstandardized coefficient, SD – standard deviation, β – standardized coefficient.*

sleep quality (c' = -0.521, p < 0.001). This means that PIU partially explained this relationship, but emotional stability had a direct effect on sleep quality that exceeded the mediating effect of PIU (Table 6 and Figure 1).

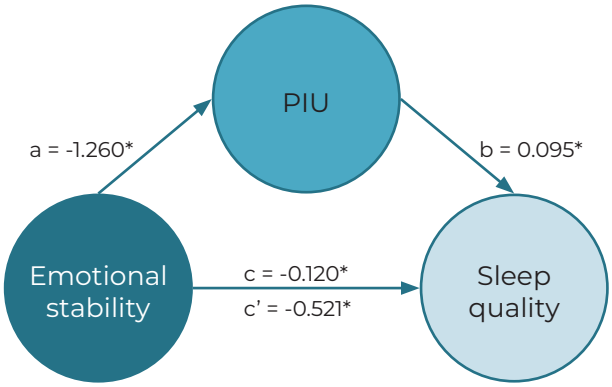



**Figure 1.** Mediation model for sleep quality

** p < 0.05*

## Discussion

As the internet permeates every aspect of life and its use becomes harder to control on a personal level, it is important to see what it affects and what influences uncontrollable use. The aim of this study was to analyse how personality traits affect internet use and sleep quality and what roles PIU and personality traits play in sleep quality in first-year university students.

The results on PIU prevalence are inconsistent - from low ones [15] to high ones [16]. Though these variations might be caused by lack of consensus on PIU diagnostics and different assessment tools. Gender comparisons also yield diverse results. The present study showed that women were more prone to PIU which is consistent with other studies [17], however, some provide the opposite result [18] and others find no differences between genders [19]. This result might be explained by different internet use between genders as it is found that women and men score higher if different internet use dimensions – women in social media and men in gaming [20]. Another factor that could explain the current result is that much more females than males participated in the study.

In this study, three out of The Big Five traits were associated with PIU – conscientiousness, agreeableness and emotional stability/neuroticism. This is consistent with previous research that shows these traits, especially emotional stability/neuroticism, are related to PIU [21;22]. However, some studies show that other traits have a relationship with PIU as well – higher levels of openness [23] and extraversion [23, 24] are linked to higher PIU. These differences might be caused by differences of personality trait levels in different cultures/regions [25].

High prevalence of poor sleep-in students was observed in this study and is in line with previous results in similar studies [26;27]. In the present study young female students had significantly worse sleep quality than males, this is consistent with a long observed result of adult women having worse sleep than men [28]. The same is observed for screen device use before sleep – use before bedtime is related to poorer sleep quality [29]. In this study agreeableness, openness and neuroticism were related to sleep quality. The most prominent was neuroticism - higher levels of this trait were associated with poorer sleep quality. This is in line with previous data. A systematic review revealed that at least one personality trait is related to sleep quality and that neuroticism is the one trait that is constant in all studies [30].

In the present study PIU was associated with poorer sleep quality. This result is in line with previous studies. A systematic analysis on this topic showed that all studies find a significant connection between PIU and sleep quality [31]. Studies also show the importance of the PIU level – higher levels of PIU demonstrate significantly worse sleep quality than those with lower levels [32]. The present study found that PIU partly explained the relationship between emotional stability/neuroticism and sleep quality. These findings confirm previous data – showing an indirect relationship – high levels of neuroticism lead to the choice of PIU as a coping strategy for difficulties, which in turn negatively affects sleep quality [33].

There were some limitations in this study. Only first-year students were invited to par-

ticipate, this might have influenced the current results, because first-year students must adapt to many new things that were not assessed and older students have already dealt with (for example, moving to another city, new friends and responsibilities, environment and so on). Psychoactive substance use (alcohol, nicotine, drugs) was also not assessed. PIU was evaluated as a whole, not considering different aspects of it (for example social media, gaming, gambling, shopping and others). This meant a narrower discussion on internet use and prevented from discovering all problematic behaviour on the internet. These factors should be considered as objects for future studies.

**Practical implications.** Based on the results of this study, it is recommended that, when discussing PIU, more attention should be given to women and younger students, as they fall into the group of higher PIU. Additionally, more educational interventions for PIU should be provided to health sciences students, as they exhibited the highest PIU. Given the poor sleep habits of first-year students, it is recommended to inform them about the importance of sleep hygiene. A higher level of emotional stability is associated with lower PIU and better sleep quality; therefore, interventions are needed that enhance students' emotional stability skills and thereby indirectly influence this trait.

## Conclusions

13.6% of first year university students exhibit the high risk of problem internet use (PIU) and female students were more susceptible and showed higher PIU risk scores. Female students demonstrated a significantly poorer sleep quality than male students. Devices are being used at bedtime, which negatively impacts sleep quality. High levels of agreeableness, emotional stability and openness are related to better sleep quality, however only emotional stability is a predictive factor of good sleep quality. Students who have higher PIU exhibit poorer sleep quality. Emotional stability directly and indirectly through PIU influences sleep quality. Even though PIU plays an important role in the relationship between emotional stability and sleep quality, it only partly explains the relation between emotional stability and sleep quality.

## Conflict of Interest Statement

The authors declare that this work is original, has not been published previously, is not under consideration by another journal, and that all authors have approved the submission The manuscript was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors take full responsibility for the final content, interpretations, and conclusions.

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