

INTEGRATION OF MANAGEMENT COMPETENCIES INTO THE TRAINING OF NEUROLOGISTS THROUGH A DIGITAL EDUCATIONAL ENVIRONMENT

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Annotation: *The digital transformation of the medical education system is raising the issue of forming clinical and managerial competencies in future neurologists. The aim of the study was to determine the effectiveness of implementing digital educational platforms and artificial intelligence tools in specialist training. The study involved 80 students (40 5th-6th-year students and 40 1st-2nd-year clinical residents) from Samarkand State Medical University. The main group (n=40) was trained using the MedSkill–Neurology interactive platform, the NeuroSim-AI virtual simulator, the e-Consult NeuroNet telemedicine module, and the NeuroPrompt AI assistant. The control group (n = 40) practiced according to the traditional program. The results showed a significant increase in the level of professional readiness in the main group (86.4 ± 5.2 versus 62.3 ± 6.1 points, $p < 0.001$), management competencies (8.1 ± 1.0 versus 4.5 ± 1.3 on the WHO scale, $p < 0.01$), improvement in analytical thinking (81.6% versus 58.9%, $p < 0.001$), and a 2.5-fold decrease in diagnostic errors (12.4% versus 31.8%, $p < 0.01$).*

Keywords: *medical education, neuroscience, digital educational environment, artificial intelligence, simulation learning, management competencies, clinical thinking, telemedicine.*

Research objective. Developing and scientifically substantiating a model for forming clinical and managerial competencies in future neurology specialists within a digital educational environment using artificial intelligence tools and simulation technologies.

Research materials and methods. A prospective comparative study was conducted at the Department of Health Organization and Neurology of Samarkand State Medical University during the period of 2023–2025. The study included 80 participants: 40 5th-6th-year students of the Faculty of



Medicine and 40 clinical residents with 1-2 years of training in the specialty "Neurology." The average age of the participants was 24.6 ± 2.8 years. Distribution by gender: 52 women (65%) and 28 men (35%). The selection was voluntary, subject to informed consent to participate. Data analysis was performed using SPSS 26.0 and Excel 2021. Descriptive statistics methods, Student's t-test, and Pearson's correlation analysis were applied. The significance of the differences was taken as $p < 0.05$. The study was approved by the Local Thematic Committee of Samarkand State Medical University (Protocol No. 7 dated 2023). All participants provided written informed consent.

Results. Participants in the main group who were trained using digital and AI tools demonstrated a statistically significant increase in all key indicators. The level of professional readiness increased from 62.3 ± 6.1 to 86.4 ± 5.2 points ($p < 0.001$), indicating a 38.6% improvement in clinical thinking. Management competencies increased from 4.5 ± 1.3 to 8.1 ± 1.0 on the WHO scale ($p < 0.01$), representing an 80% increase. Analytical thinking increased from 58.9% to 81.6% ($p < 0.001$).

The involvement of students in the learning process increased from 63.1% to 88.9% ($p < 0.001$). Satisfaction with digital learning formats increased from 54.7% to 91.2% ($p < 0.001$). The most significant result was a decrease in diagnostic errors during the interpretation of MRI and EEG from 31.8% in the control group to 12.4% in the main group ($p < 0.01$), which corresponds to a 2.5-fold reduction in errors. Analysis of the questionnaires showed a higher readiness of clinical residents to integrate digital and managerial elements of training. Among the residents, 95.0% consider digital technologies necessary (versus 87.5% of students, $p < 0.05$), 85.0% note an improvement in clinical thinking when working with AI (versus 68.0% of students), 90.0% consider the development of management skills important (versus 75.0% of students), and 92.5% positively assessed telemedicine simulations (versus 70.0% of students). Only 10.0% of residents and 22.5% of students experienced difficulties with digital platforms ($p < 0.05$). Women ($n = 52$) demonstrated higher engagement in digital learning (86.3 ± 6.5 versus 79.2 ± 7.8 in men, $p < 0.05$) and a more positive perception of interactive formats (92.3% consider digital technologies necessary versus 88.5% in men). However, differences in managerial competencies between the sexes did not reach statistical significance (7.8 ± 1.0 versus 7.1 ± 1.1 points, $p > 0.05$). Men were faster at mastering analytical AI tools (83.2% versus 79.5% for women



on the cognitive style scale). Digital adaptability was high in both groups (92.1% in women and 89.3% in men, $p > 0.05$). Clinical residents showed a higher increase in professional readiness (+27% in the main group) and management skills (+32%) compared to students, which is explained by their clinical experience and the need to integrate digital tools into real practice. The level of interdisciplinary interaction increased from 61.5% to 86.0% ($p < 0.01$), and self-assessment of decision-making ability increased from 3.1 ± 0.6 to 4.4 ± 0.5 points on the Likert scale ($p < 0.01$).

Conclusions

The integration of digital platforms (MedSkill–Neurology, NeuroSim-AI, SmartTutor, NeuroPrompt) into the educational process of neurologist training contributes to the development of clinical thinking, management, and communication skills, and is a promising direction for modernizing higher medical education. The use of virtual simulators and AI assistants significantly improves diagnostic skills and the interpretation of neural imaging data, which is objectively expressed in a 2.5-fold reduction in diagnostic errors. The telemedicine module and feedback system contribute to the development of managerial thinking, remote interaction skills, and the substantiation of clinical decisions and functions within an interdisciplinary team.

Literature:

1. Loginova E.N. Formation of professional readiness of doctors: competency-based approach and digital learning technologies. - M.: GEOTAR-Media, 2020. - 214 p.

2. WHO. Global Competence Framework for Universal Health Coverage. - Geneva: World Health Organization, 2022. - 56 p.

Harden R.M., Crosby J.R. The good teacher is more than a lecturer — the twelve roles of the teacher // Medical Teacher. – 2000. - Vol. 22, No. 4. — P. 334–347.

4. Frenk J., Chen L., Bhutta Z.A., Cohen B., Crisp N., Evans T., Fineberg H., Garcia P., Ke Y., Kelley P., Kistnasamy B., Meleis A., Naylor D., Pablos-Méndez A., Reddy S., Scrimshaw D., Sepulveda J., Serwadda D., Zurayk H. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world // The Lancet. - 2010. - Vol. 376. - P. 1923–1958.

