ORIGINAL ARTICLE

CONTENTS

Artificial intelligence as a clinical tutor in telemedicine: Opportunities and challenges in medical education

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ABSTRACT

Aim: To analyze key aspects of the application of AI as a clinical mentor in telemedicine-based medical education, and to assess the related opportunities, challenges, and attitudes of pediatric students.

Materials and Methods: A cross-sectional study was conducted to assess the level of digital competence of future pediatricians regarding telemedicine and AI. A total of 251 students from the Faculty of Pediatrics at Bogomolets National Medical University (BNMU) participated in the survey. Participants were aged 17 to 26 years, of whom 17.9% were male and 82.1% were female. The questionnaire included items on demographic characteristics, knowledge and use of telemedicine and AI tools, self-assessment of digital competence, and attitudes toward the integration of AI in healthcare. Data were analyzed using descriptive statistics and presented as relative frequencies (%).

Results: The study assessed digital competence and the use of AI among 251 future pediatricians regarding telemedicine-based medical education. Survey results indicated active engagement with AI tools in educational and professional tasks (63.7% positive responses), moderate confidence in integrated digital devices (55.0%), and cautious self-assessment of clinical decision support systems (53.4%). These findings informed the development and revision of courses at BNMU, enhancing students' practical skills and digital competence.

Conclusions: Future pediatricians actively engage with digital tools and AI, although confidence is higher in AI tasks than in integrated devices or clinical decision systems. The findings guided the development of updated courses to strengthen digital competence, practical skills, and critical evaluation of AI. Successful telemedicine implementation requires addressing data security, regulation, human-centred care, and digital inclusion to ensure safe, effective, and equitable healthcare.

KEY WORDS: AI, telemedicine, medical education, Clinical Tutor

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INTRODUCTION

The Strategy for the Development of Telemedicine in Ukraine (2023–2025) aims to integrate digital solutions into the healthcare system to provide remote care, particularly in wartime conditions [1]. It focuses on creating a unified telemedical space, expanding teleradiology and teleconsultations, and overcoming barriers to healthcare access through digital technologies. State policy emphasizes regulatory updates, improved technical infrastructure, and enhanced digital skills among healthcare professionals.

The strategy also outlines key aspects of digitalisation, including data protection, evaluation of effectiveness, and international cooperation, forming the basis for a modern, accessible healthcare model. By March 2026, the outcomes of its implementation are to be evaluated and reported.

In parallel, the "Framework of Digital Competence of a Healthcare Worker in Ukraine" [2] defines strategic directions for healthcare digitalisation. Based on European DigComp standards and adapted to national conditions, it structures digital skills across key areas such as data management, cybersecurity, and innovation, supporting education reform and the effective implementation of telemedicine in Ukraine.

AIM

To analyze key aspects of the application of AI as a clinical mentor in telemedicine-based medical education and to assess the related opportunities, challenges, and attitudes of pediatric students.

MATERIALS AND METHODS

The empirical basis of the study consisted of survey responses collected from future pediatricians as part of an assessment of digital competence in the context of telemedicine and AI. A cross-sectional study design was applied. A total of 251 students from the Faculty of Pediatrics at Bogomolets National Medical University voluntarily participated in the study. The participants were aged 17 to 26 years, including 17.9% males and 82.1% females.

Data were collected using a structured questionnaire specifically developed for this study. The questionnaire included several key sections: socio-demographic characteristics (age, gender); knowledge and use of telemedicine and AI tools; self-assessment of digital competence; and attitudes toward the integration of AI into healthcare practice.

The study employed general scientific methods, including survey analysis and descriptive statistics. The collected data were processed and presented as relative frequencies (%), allowing for the evaluation of trends in digital competence and the use of AI technologies among future pediatricians.

In the context of ongoing digital transformation in healthcare, particular attention was given to the role of AI and telemedicine in shaping professional competencies. The aim of this study was to assess the level of digital competence among future pediatricians and to explore their experience, attitudes, and readiness to integrate AI-driven technologies into clinical practice.

ETHICS

The study was conducted in accordance with the principles of the Declaration of Helsinki and generally accepted bioethical standards for conducting sociological research in the medical field. All participants (N=251) were informed about the purpose, objectives, and voluntary nature of the study and provided informed consent prior to participation. The survey was anonymous, ensuring the confidentiality of personal data and protecting the academic and professional integrity of respondents.

Data processing was carried out in a depersonalized manner, and the results are presented in aggregated form, which eliminates the possibility of identifying individual participants.

The research protocol and instrument (questionnaire) underwent peer review and received approval from the local Bioethics Committees of the Bogomolets National Medical University.

FRAMEWORK

The study was conducted as a part of the research project within the framework of the international ERASMUS+ UkraineDigiTrans project (GA number 101179494).

RESULTS

The survey revealed varying levels of digital competence among future pediatricians regarding telemedicine and AI use. For general digital tools in medical practice, 50.6% of respondents rated themselves positively, 39.0% negatively, and 10.4% were undecided. Competence in clinical decision support systems was slightly higher, with 53.4% positive, 35.8% negative, and 10.8% undecided responses. AI tool usage in educational and professional contexts was reported by 63.7% of students, while 33.1% reported non-use and 3.2% were undecided. Regarding integrated digital devices and applications, 55.0% considered themselves competent, 35.0% non-competent, and 10.0% were uncertain.

These findings informed the revision of the course "Features of Artificial Intelligence Application in Pediatric Practice" and the development of "Telemedicine in the Healthcare System" at Bogomolets National Medical University under the ERASMUS+ UkraineDigiTrans project. Overall, students demonstrate active engagement with digital tools and AI; however, gaps in confidence highlight the need for structured training and practical experience to strengthen digital competence in clinical practice.

Modern educational programs require continuous improvement and regular updating to meet current demands and employers' expectations. A key element in this process is the development of digital competence among higher education students, particularly future physicians. The Telemedicine Development Strategy in Ukraine (2023–2025) aims to integrate digital solutions into the healthcare system to ensure remote medical care, especially in the context of war [1–3]. The strategy envisages the creation of a unified telemedicine space and the implementation of teleradiology and teleconsultations, which by 2024 will cover more than 30 medical guarantee packages. The primary objective of the initiative is to overcome barriers to healthcare access caused by military aggression through the integration of remote technologies into a unified digital healthcare system.

State policy focuses on updating regulatory frameworks, improving technical equipment in hospitals, and enhancing the qualifications of medical personnel for working with innovative technologies. Furthermore, by 31 March 2026, those responsible for the telemedicine development direction are required to evaluate the outcomes of the Telemedicine Development Strategy in Ukraine and submit a report to the Cabinet of Ministers of Ukraine. At the same time, emphasis is placed on the development of telemedicine within the "Digital Competence Framework for Healthcare Workers in Ukraine" [2], which defines strategic approaches to healthcare digitalisation. This framework was developed based on

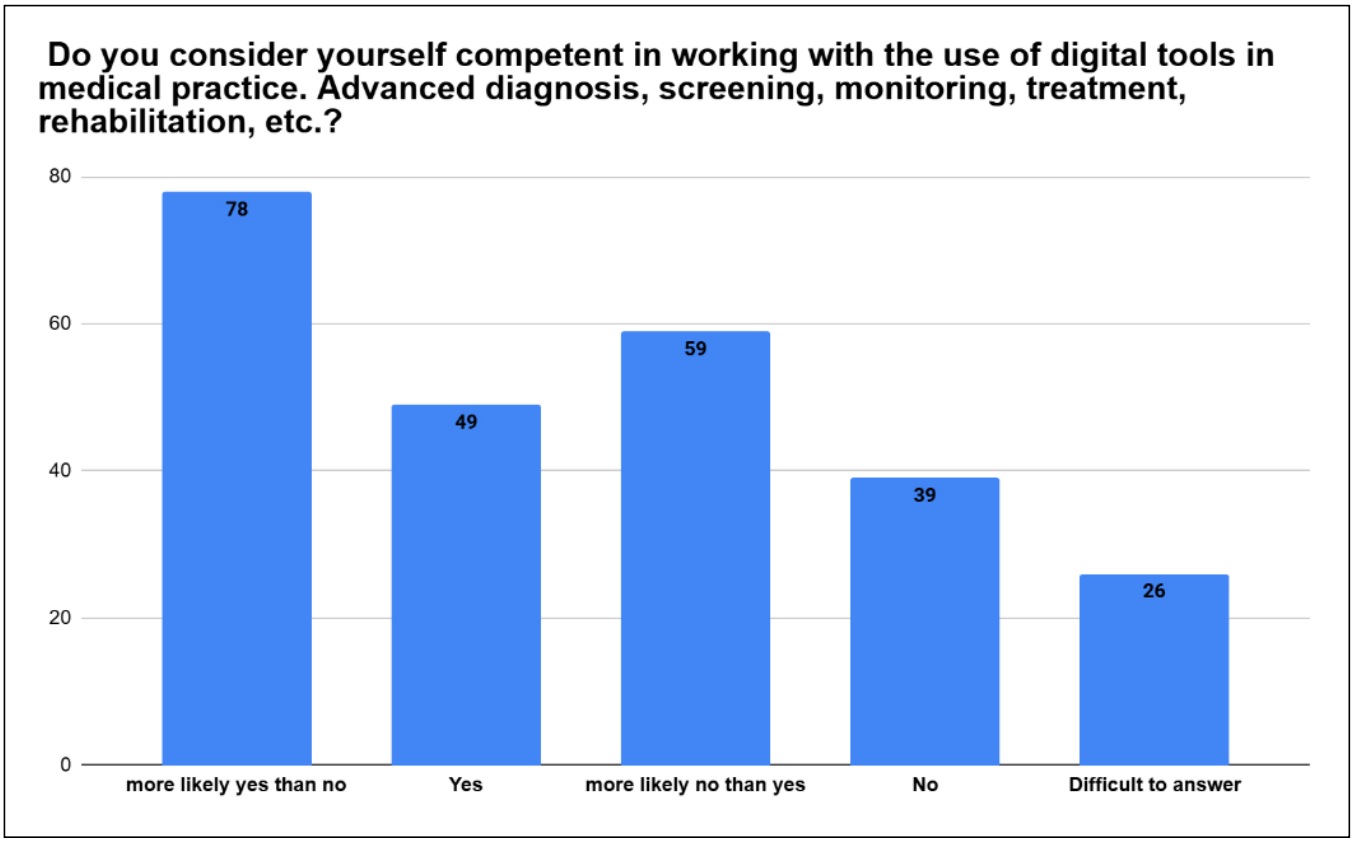

Fig. 1. Distribution of responses regarding the use of digital tools in medical practice
Picture taken by the authors

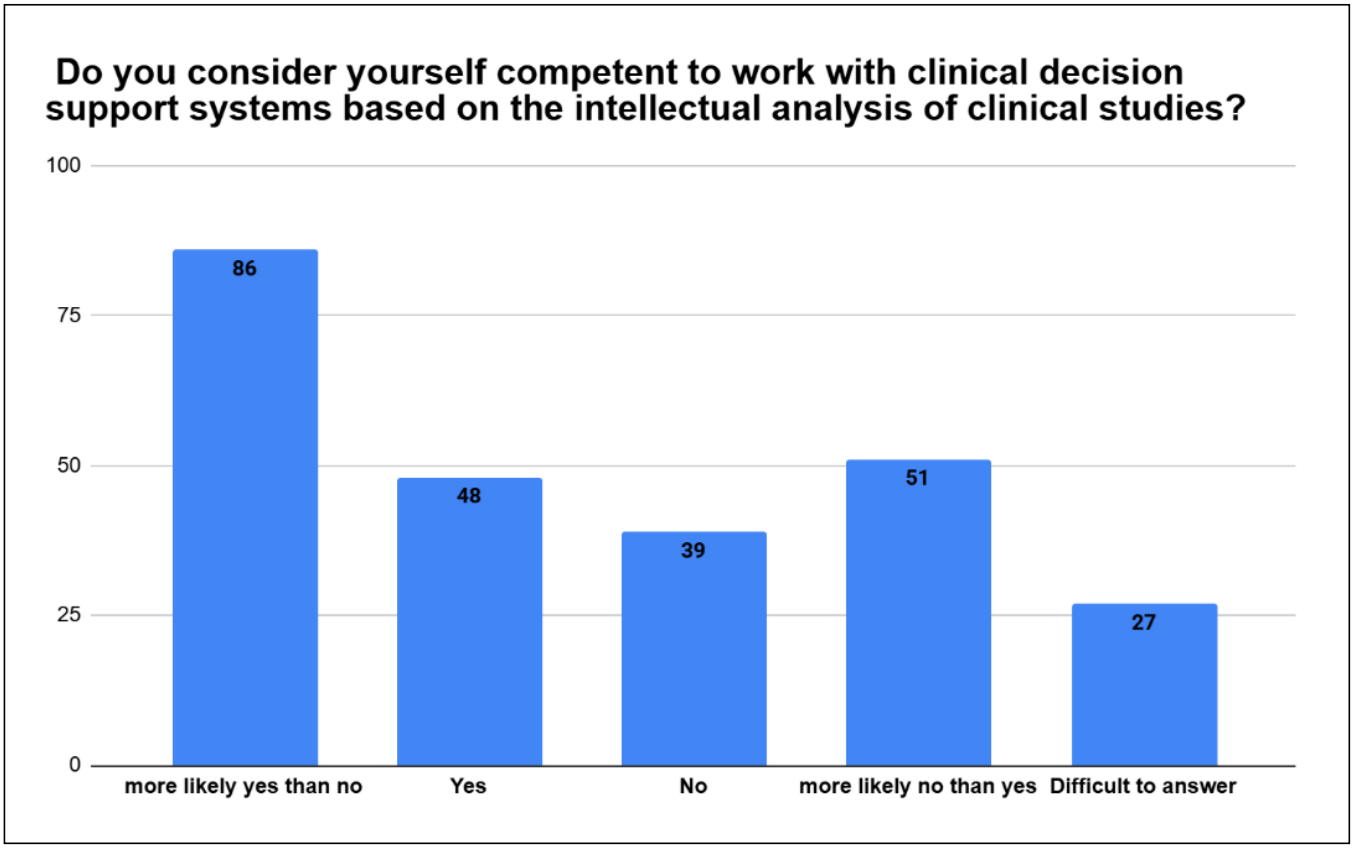

Fig. 2. Distribution of responses regarding the use of clinical decision support systems
Picture taken by the authors

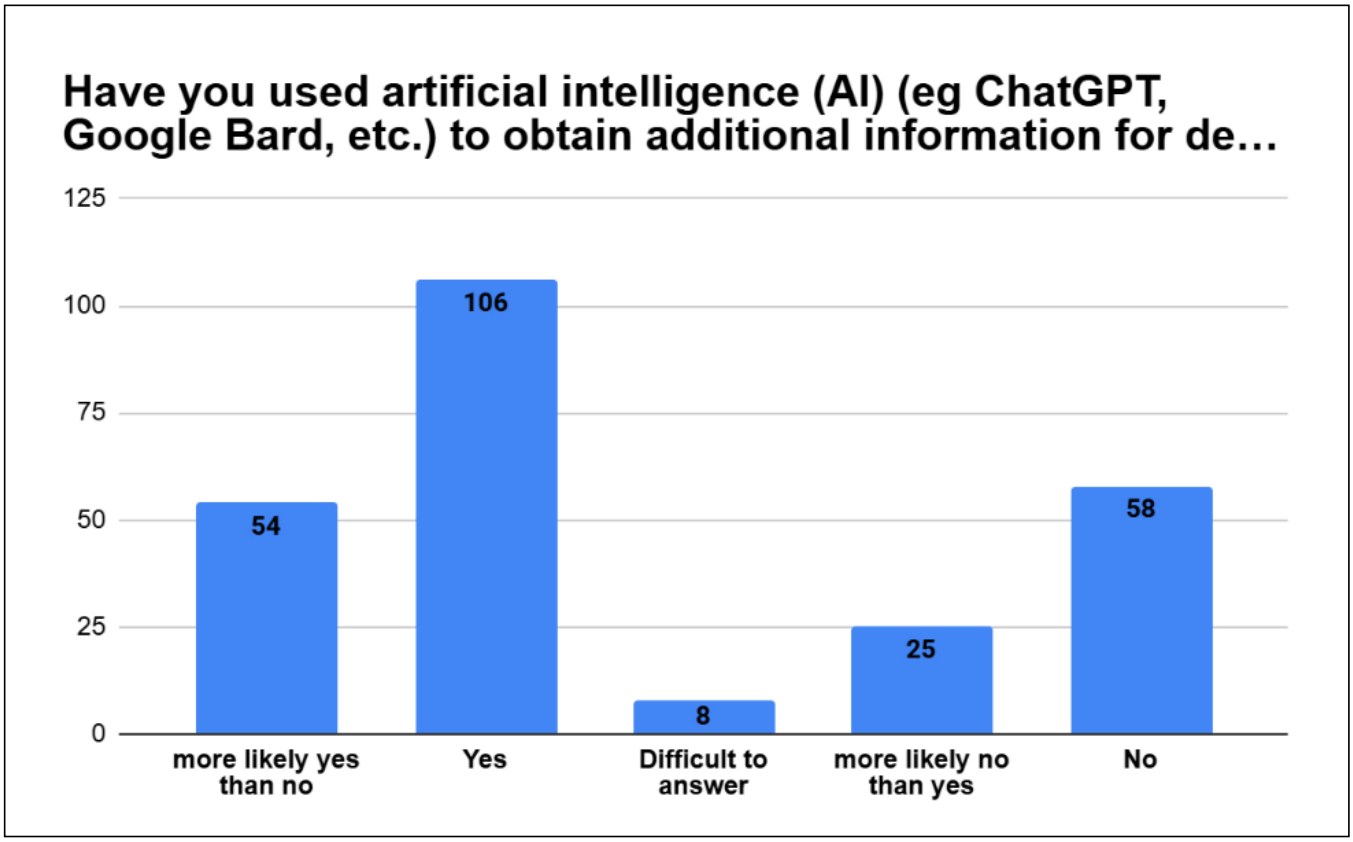

Fig. 3. Distribution of responses regarding the use of AI
Picture taken by the authors

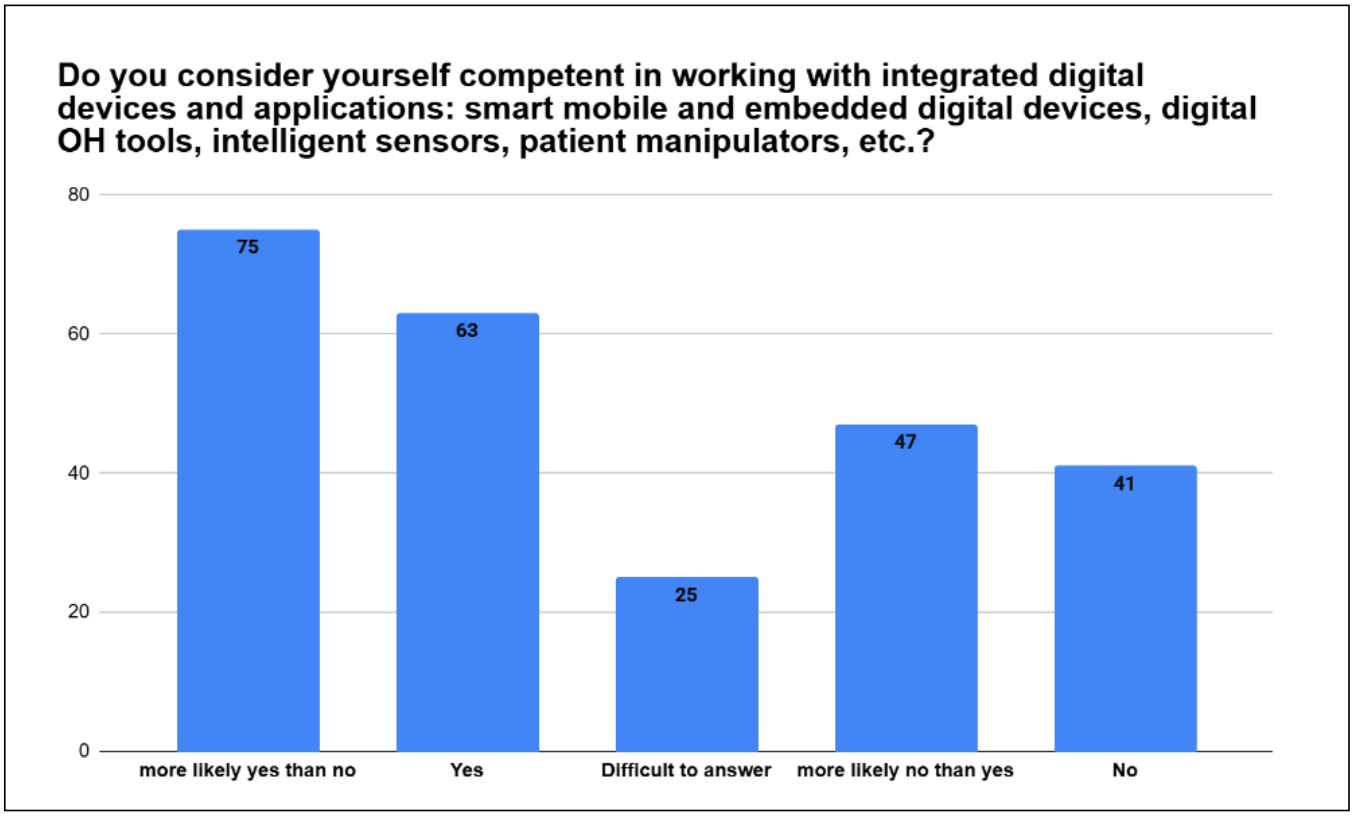

Fig. 4. Distribution of responses regarding the use of integrated digital devices and applications
Picture taken by the authors

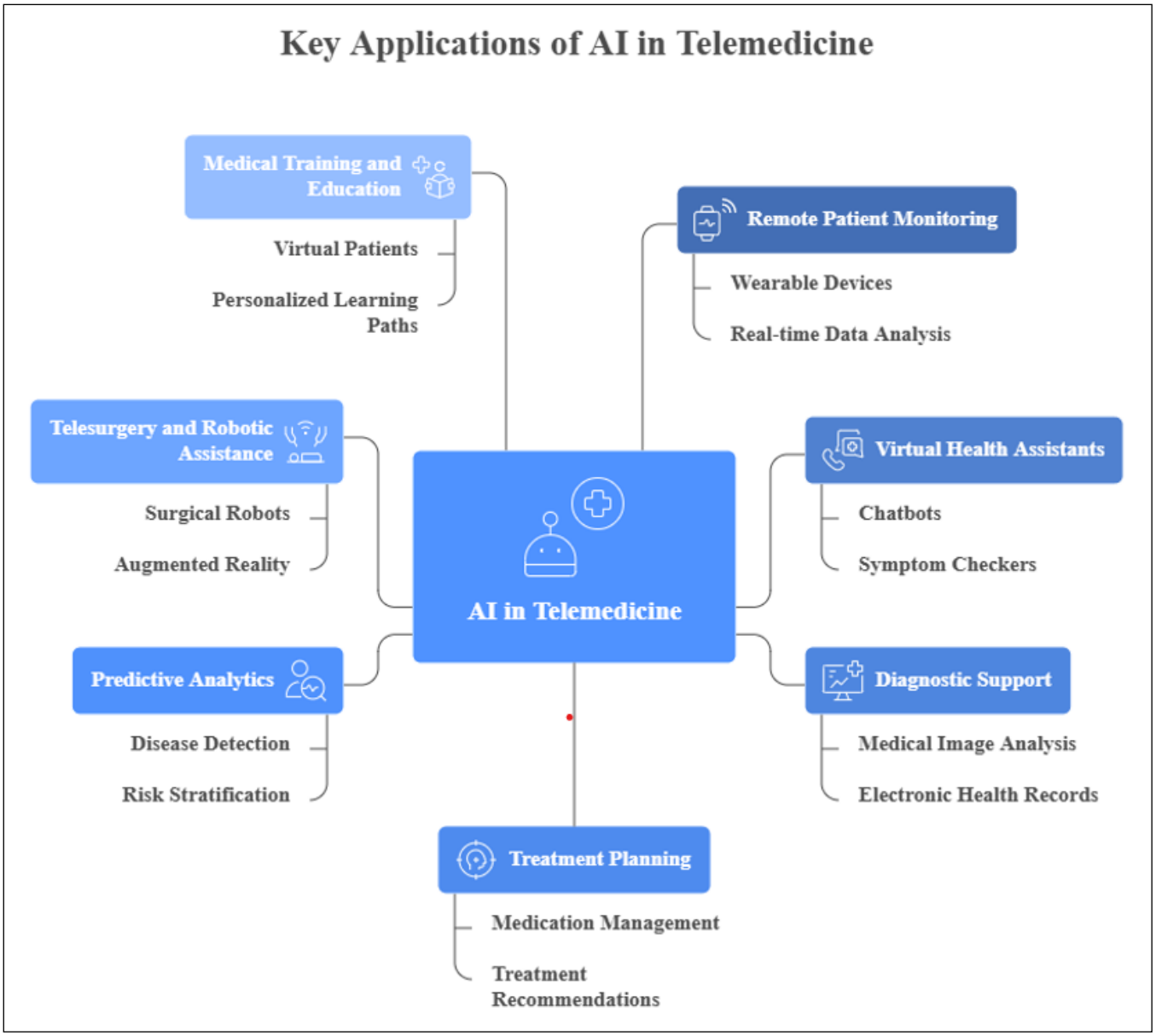

Fig. 5. Mental map of AI integration into telemedicine
Picture taken by the authors

European DigComp standards and adapted to national specifics, taking into account the challenges of martial law and the development of the electronic healthcare system (eHealth). Telemedicine is categorised under Sphere 3: Digital communication, interaction, and collaboration in the digital environment [4–6].

It is considered a critical component of a healthcare professional's digital competence, focusing specifically on the ability to participate in telemedicine consultations. Key aspects of telemedicine education include recommended resources, expected outcomes, and integration with other digital competencies. Recommended resources involve specialized courses on platforms like Prometheus and communication tools such as Zoom, Google Meet, and Microsoft Teams for simulations. The main educational goal is to gain practical experience in remote medical interaction. Telemedicine skills are closely connected with professional digital communication, secure clinical data exchange, electronic correspondence with patients and colleagues, and management of e-documents, including e-prescriptions and referrals within the eHealth system. In addition to these communication-related aspects, the sources emphasize that digital transformation in healthcare also involves understanding digital health interoperability and the strategic directions set by organizations such as the WHO to ensure that these remote systems function effectively within the broader healthcare landscape. The role of AI as a "clinical mentor" for medical students

is particularly relevant in telemedicine, where the combination of remote access, virtual patients, and AI analysis enables clinical training without physical presence [5–8]. Instructors can create scenarios for student learning, demonstrate telemedicine devices equipped with AI, and more. Within the scope of our study, students responded to questions regarding their proficiency in using telemedicine tools and AI.

Regarding competence in using digital tools in medical practice (e.g., diagnostics, screening, monitoring, treatment, rehabilitation), respondents reported moderate self-assessed competence. Positive responses accounted for 50.6%, negative responses for 39.0%, and 10.4% were undecided (Fig. 1).

Regarding competence in using clinical decision support systems based on intelligent analysis of clinical studies, respondents reported a generally cautious-positive self-assessment. Positive responses accounted for 53.4%, negative responses for 35.8%, and 10.8% were undecided, reflecting some uncertainty among students (Fig. 2).

Regarding the use of AI tools (e.g., ChatGPT, Gemini) for decision-making in professional or educational activities, respondents showed a high level of adoption and active integration. Positive responses accounted for 63.7%, negative responses for 33.1%, and 3.2% were undecided (Fig. 3).

Regarding the question on competence in using integrated digital devices and applications (e.g., smart mobile and embedded devices, digital health tools, intelligent sensors, patient simulators), respondents reported a moderately high level of self-assessed digital competence. Positive responses accounted for 55.0%, negative responses for 35.0%, and 10.0% were undecided, reflecting uncertainty or limited experience with these technologies (Fig. 4).

The survey results formed the basis for revising the syllabus of the course "Features of Artificial Intelligence Application in Pediatric Practice" and for creating a new educational course, "Telemedicine in the Healthcare System", at Bogomolets National Medical University within the framework of the ERASMUS+ UkraineDigiTrans project (GA number 101179494).

The course "Features of Artificial Intelligence Application in Pediatric Practice" develops students' knowledge and practical skills in AI technologies, including their application in diagnostics, treatment, telemedicine, and medical visualisation. It also promotes critical evaluation of AI, integration of digital tools into clinical reasoning, and adherence to ethical and data security standards.

The course "Telemedicine in the Healthcare System" provides future pediatricians with essential knowledge and practical skills for using telemedicine tools in clinical practice, supporting the digital transformation of healthcare in Ukraine.

The integration of AI into telemedicine (Fig. 5) offers significant opportunities for improving the accessibility and quality of healthcare services [9]. However, this process is accompanied by important challenges and considerations. A key aspect is ensuring data privacy and security. Telemedicine platforms handle large volumes of sensitive medical information and must ensure reliable protection against data breaches, unauthorised access, and cyberattacks. Adherence to international and national data protection standards, as well as the implementation of modern encryption and secure data transmission technologies, is essential for maintaining patient trust in digital healthcare services.

Another key challenge is regulatory compliance. Healthcare is highly regulated, and AI-based telemedicine must meet licensing, accreditation, and quality standards. Differences in regulations across regions may hinder scalability and slow innovation. Maintaining the human aspect of medicine remains critical. Despite AI efficiency, empathy and personal interaction are essential; therefore, telemedicine should complement rather than replace physicians, ensuring a balance between technology and human-centred care.

DISCUSSION

The high level of AI usage among respondents indicates its active integration into the educational and early professional activities of future physicians. This confirms the potential of AI as an effective tool for enhancing learning productivity, optimising routine tasks, and supporting clinical reasoning. The obtained results are consistent with global trends in the digitalisation of medical education, where AI is considered an important component in the formation of modern professional competencies [10, 11].

At the same time, the moderate level of confidence in using integrated digital devices and clinical decision support systems indicates a gap between the frequency of AI use and the depth of digital competence. This discrepancy may reflect superficial interaction with technologies without sufficient understanding of their clinical potential. This highlights the need to implement more structured, practice-oriented training aimed at developing skills in applying complex digital solutions in real clinical settings [12, 13].

A proportion of respondents demonstrated uncertainty or limited experience with digital tools, indicating insufficient practical training. These findings emphasise the importance of systematically integrating the development of digital competence into medical education curricula, particularly through simulation-based learning, the use of virtual patients, and clinical case analysis [5, 8].

The role of AI as a "clinical tutor" in telemedicine opens new opportunities for remote clinical training. The combination

of virtual patients, data analysis, and decision-support algorithms enables the simulation of clinical scenarios without physical presence, which is especially relevant in conditions of limited access to clinical practice. At the same time, the effective implementation of such approaches requires addressing several critical issues, including ensuring data privacy and security, compliance with regulatory requirements, and maintaining the principles of patient-centred care [14, 15].

Despite technological progress, the study results confirm that the human factor remains key in medical practice. Empathy, clinical reasoning, and interpersonal interaction cannot be fully replaced by algorithms. Thus, AI should be considered a complementary tool that enhances physicians' capabilities rather than replacing them. Maintaining a balance between technological innovation and humanistic values is critically important for the sustainable development of modern healthcare systems [16, 17].

CONCLUSIONS

These findings informed the revision of the course "Features of Artificial Intelligence Application in Pediatric Practice" and the development of a new course, "Telemedicine in the Healthcare System", at Bogomolets National Medical University within the ERASMUS+ UkraineDigiTrans project. These educational initiatives aim to develop students' theoretical knowledge and practical skills, enhance digital competence, foster critical evaluation of AI solutions, integrate digital tools into clinical reasoning, and ensure adherence to ethical and legal standards.

The integration of AI into telemedicine offers significant opportunities for improving healthcare accessibility and quality but is accompanied by several challenges. Key concerns include ensuring data privacy and security, compliance with regulatory requirements, maintaining the human aspect of patient interaction, and addressing digital inequality.

The successful realisation of the potential of digital medicine and AI in telemedicine requires a comprehensive approach that combines technological advancement with systematic support in education, regulation, security, and inclusivity. Only such a strategy can ensure the effective, safe, and equitable use of telemedicine in modern healthcare systems.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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