TRANSFORMATION OF CLINICAL REASONING IN THE CONTEXT OF DIGITALIZATION: RISKS AND OPPORTUNITIES OF AI INTEGRATION IN MEDICAL EDUCATION

Yusupova Dildora Uktamovna
Assistant at the Department of Physiology,
Samarkand State Medical University
ORCID: https://orcid.org/0009-0008-1455-8810

Abstract. At present, we are witnessing a significant reduction in the traditional diagnostic pathway from symptom to diagnosis, driven by rapid technological advancement. However, this efficiency conceals a potential pedagogical trap: students may master the use of digital tools without grasping the underlying pathophysiological mechanisms. Historically, the development of clinical reasoning mirrored a detective's investigation, requiring the meticulous synthesis of clinical signs to construct a logical diagnostic hypothesis. The intervention of Artificial Intelligence (AI) has fundamentally altered this process. The necessity for students to laboriously recall rare pathologies or complex syndromes is being superseded by neural networks capable of providing instantaneous differential diagnoses. While this enhances information access, it creates a "veneer of omniscience" that may compromise the development of independent analytical skills. The relevance of this study lies in identifying educational strategies that allow future medical professionals to leverage the computational power of AI while maintaining the cognitive resilience necessary for autonomous decision-making, particularly in cases of system failure or algorithmic bias.

Keywords. clinical reasoning, pathophysiological mechanisms, diagnostic hypothesis, veneer of omniscience, cognitive resilience, algorithmic bias, artificial intelligence.

ТРАНСФОРМАЦИЯ КЛИНИЧЕСКОГО МЫШЛЕНИЯ В КОНТЕКСТЕ ЦИФРОВИЗАЦИИ: РИСКИ И ВОЗМОЖНОСТИ ИНТЕГРАЦИИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В МЕДИЦИНСКОМ ОБРАЗОВАНИИ

Юсупова Дилдора Уктамовна
Ассистент кафедры физиологии, Самаркандский государственный медицинский университет
ORCID: https://orcid.org/0009-0008-1455-8810

Аннотация. В настоящее время мы наблюдаем значительное сокращение традиционного диагностического пути от симптома к диагнозу, обусловленное быстрым технологическим прогрессом. Однако эта эффективность скрывает потенциальную педагогическую ловушку: студенты могут освоить использование цифровых инструментов, не понимая лежащих в их основе патофизиологических механизмов. Исторически развитие клинического мышления отражало расследование детектива, требующее тщательного анализа клинических признаков для построения логической диагностической гипотезы. Внедрение искусственного интеллекта (ИИ) коренным образом изменило этот процесс. Необходимость для студентов кропотливо запоминать редкие патологии или сложные синдромы уступает место нейронным сетям, способным мгновенно предоставлять дифференциальные диагнозы. Хотя это улучшает доступ к информации, это создает «видимость всезнания», которая может поставить под угрозу развитие независимых аналитических навыков. Актуальность данного исследования заключается в выявлении образовательных стратегий, которые позволят будущим медицинским работникам использовать вычислительную мощность ИИ, сохраняя при этом когнитивную устойчивость, необходимую для автономного принятия решений, особенно в случаях системных сбоев или алгоритмической предвзятости.

Ключевые слова: клиническое мышление, патофизиологические механизмы, диагностическая гипотеза, видимость всезнания, когнитивная устойчивость, алгоритмическая предвзятость, искусственный интеллект.

Introduction. Modern medical education faces a "digitalization paradox": while the rapid implementation of artificial intelligence (AI) shortens the path from symptom to diagnosis, it simultaneously threatens the degradation of classical clinical reasoning. Traditionally, physician training was built upon the "diagnostic detective" method—independent symptom collection and the construction of logical causal chains. Today, this process is being automated, leading to a risk of cognitive offloading.

The core problem lies in the formation of an "illusion of explanatory depth" among students: instantaneous access to neural network prompts replaces the profound analysis of pathophysiological mechanisms. Consequently, future specialists may lose cognitive autonomy—the ability to make decisions in the absence of technology or in the event of an algorithmic error.

Materials and Methods. The methodological framework of this study comprises a systems analysis of educational transformation in medical universities and an empirical comparison of diagnostic search strategies when interacting with

AI algorithms. The study was comprehensive and included several interconnected levels of analysis.

Theoretical-Analytical Stage:

A comparative analysis was conducted between classical models of clinical reasoning and modern concepts of digital learning. The psychological mechanisms of "cognitive load reduction" and their impact on long-term medical knowledge retention were examined.

Empirical Stage and Study Design:

To assess the practical transformation of reasoning, a controlled pedagogical study was conducted at a medical university. Participants included final-year students ($n=100$), divided into two representative groups:

- Control Group: Performed diagnostic tasks relying solely on fundamental knowledge and standard print references.
- Experimental Group: Had access to clinical decision support systems (CDSS) and generative AI models to verify their hypotheses.

The diagnostic search was evaluated based on three key metrics:

1. Cognitive Depth: The ability to justify the pathophysiological link between symptoms (as opposed to a simple list of diagnoses).
2. Verificational Robustness: The ability to recognize a "premeditated AI error" inserted into the task (testing for "automation bias" or blind trust).
3. Adaptation Speed: The time taken to generate a differential diagnostic range.

Statistical significance was ensured using Student's t-test and the non-parametric Mann-Whitney U-test. Qualitative data from reflective analysis (student self-assessment of confidence) were processed using content analysis.

Results

The comparative analysis revealed fundamental differences in the architecture of clinical decision-making:

Metric (Criterion)	Control Group (Without AI)	Experimental Group (With AI)
Diagnostic Speed	65%	95%
Accuracy (Complex Cases)	72%	88%
Depth of Justification (Pathogenesis)	85%	45%
Critical Evaluation (Error Detection)	78%	32%
Self-Assessment Level (Confidence)	60%	90%

The experimental group demonstrated a clear advantage in the technical aspects of diagnostics. Their speed reached 95% of the benchmark, exceeding the control group by 30%. Diagnostic accuracy in complex cases was also higher (88% vs. 72%), confirming AI's efficacy as an analytical reference tool.

However, a critical decline in the quality of diagnostic justification was observed. The depth of pathogenesis analysis was only 45%, compared to 85% in the control group. This indicates that when using AI, students tend to bypass the stage of constructing logical causal relationships, accepting a ready-made answer without understanding the disease mechanisms.

The most concerning data involved resistance to algorithmic errors. Students working with AI showed the lowest result in critical evaluation (32%). Most displayed "blind trust" in the system, failing to notice the embedded errors. Furthermore, the "illusion of knowing" phenomenon was identified: the subjective confidence of the experimental group reached 90%, significantly overestimating their actual analytical capabilities.

Conclusion

1. Technological Dualism in Education: AI integration significantly increases operational efficiency (speed increases by 30-35%) but creates a "productivity trap," where technical success replaces deep cognitive analysis.

2. Erosion of the Analytical Component: Relying on algorithmic solutions leads to the degradation of pathophysiological reasoning skills. Students delegate the construction of logical links to AI, resulting in fragmented knowledge.

3. Algorithmic Dependency: There is a high risk of "blind trust"; over 80% of students failed to critically question erroneous AI conclusions, indicating a loss of cognitive autonomy.

4. The "Illusion of Explanatory Depth": High-tech tools artificially inflate professional self-esteem, creating a gap between perceived competence and internalized knowledge, leading to professional infantilism.

5. Requirement for a New Didactic Model: Maintaining the quality of medical training requires a transition to a "Hybrid Clinical Intelligence" model. Training must focus on metacognitive skills: the ability to audit algorithms, recognize cognitive biases, and make decisions without digital support.

References

1. Galanova T.A., Petrova E.V., Turgeneva L.B. "Role-playing games" as a method of active learning for students at the Department of Therapeutic Dentistry // *Smolensk Medical Almanac. Higher School Pedagogy.* 2016; (2): 161–164.

2. Konoplya A.I. Competency-based model of medical specialist training // *Higher Education in Russia.* 2010; (1): 98–101.

3. Tsepov L.M., Nikolaev A.I., Galanova T.A., et al. Modular program of competency-based training for students at the Department of Therapeutic Dentistry // *Smolensk Medical Almanac.* 2015; (2): 250–254.