УДК 378.147:614.256:616
DOI https://doi.org/10.11603/m.2414-5998.2026.1.16031

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STRATEGY FOR DEVELOPING OF CLINICAL THINKING: HOW TO AVOID MEDICAL MISTAKES

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СТРАТЕГІЯ РОЗВИТКУ КЛІНІЧНОГО МИСЛЕННЯ: ЯК УНИКНУТИ МЕДИЧНИХ ПОМИЛОК

The contemporary paradigm of clinical thinking, understood as a dynamic process of analyzing medical information to formulate well-reasoned conclusions, represents a key professional competence of a physician. The integration of knowledge, experience, practical skills, and humanistic values within clinical reasoning enables physicians to establish accurate diagnoses and develop effective treatment plans that consider the individual needs of patients.

This article substantiates the relevance of developing clinical thinking as a core professional competence of modern physicians in the context of increasing complexity of healthcare and growing requirements for patient safety. Clinical thinking is conceptualized as an integrative cognitive process that combines analytical, intuitive, and reflective mechanisms of decision-making based on evidence-based medicine, clinical experience, and patient-specific characteristics. The study analyses major factors contributing to medical errors, including cognitive biases, insufficient communication within multidisciplinary teams, information overload, emotional burnout, and limited hands-on clinical experience.

A strategy for the development of clinical thinking is proposed, involving the systematic implementation of clinical case-based learning, simulation-based training, algorithmization of diagnostic processes, and the development of clinical reflection and metacognitive regulation skills. Particular attention is paid to fostering a culture of patient safety, strengthening interprofessional collaboration, and applying the principles of evidence-based medicine as tools for risk minimization. The importance of pedagogical support, mentorship, and the creation of a safe educational environment for cultivating responsible clinical decision-making is emphasized.

The study demonstrates that the purposeful development of clinical thinking in the professional training of future physicians is an effective approach to preventing medical errors, improving the quality of healthcare, and ensuring patient safety. The findings may contribute to the enhancement of educational programmes in higher medical education institutions.

Key words: clinical thinking; cognitive biases; systems of thinking.

Анотація. Сучасна парадигма клінічного мислення, як динамічного процесу аналізу медичної інформації з метою формування обґрунтованих висновків, є ключовою професійною компетентністю лікаря. Інтеграція знань, досвіду, навичок і людських цінностей під час клінічного мислення допомагає лікарю визначити діагноз, розробити ефективний план лікування з урахуванням індивідуальних потреб пацієнта. У статті обґрунтовано актуальність формування клінічного мислення як ключової професійної компетентності сучасного лікаря в умовах зростання складності медичної допомоги та підвищених вимог до безпеки пацієнтів. Розкрито сутність клінічного мислення як інтегративного когнітивного процесу, що поєднує аналітичні, інтуїтивні та рефлексивні механізми прийняття рішень на основі доказової медицини, клінічного досвіду та індивідуальних особливостей пацієнта. Проаналізовано основні чинники виникнення медичних помилок: когнітивні викривлення, дефіцит комунікації в мультидисциплінарній команді, перевантаження інформацією, емоційне вигорання та недостатній рівень практичної підготовки.

Запропоновано стратегію розвитку клінічного мислення, що передбачає системне впровадження клінічних кейсів, симуляційного навчання, алгоритмізації діагностичного процесу, формування навичок клінічної рефлексії та метакогнітивного контролю. Особливу увагу приділено розвитку культури безпеки, міжпрофесійної взаємодії та використанню принципів доказової медицини як засобів мінімізації ризиків. Підкреслено значення педагогічного супроводу, наставництва та створення безпечного освітнього середовища для формування відповідального ставлення до клінічних рішень.

Доведено, що цілеспрямований розвиток клінічного мислення у процесі професійної підготовки майбутніх лікарів є ефективним шляхом профілактики медичних помилок, підвищення якості медичної допомоги та забезпечення безпеки пацієнтів. Результати можуть бути використані для удосконалення освітніх програм у закладах вищої медичної освіти.

Ключові слова: клінічне мислення; когнітивні упередження; системи мислення.

Introductiom. Nowaday's concept of clinical thinking has undergone a long historical development.: from the time of Hippocrate, who laid the foundations for observing symptoms and collecting medical histories, and later René Descartes and John Locke, the founders of the theory of logical and critical thinking, to the widespread popularization of this scientific field thanks to the works of Jerold Green and David Shenfield and the contemporary recognition of clinical thinking as the "art of healing" in the works of Robert Ennis and Abraham Verghese (Davydova et al., 2021).

Thus, the relevance of clinical thinking is the result of the evolution of medical thought, where the integration of knowledge, experience, logic, and empathy are key (Malanchuk et al., 2024).

The aim of the article is to analyze the causes of medical errors through the lens of critical thinking and the role of cognitive biases, by analyzing the interdependence of the two systems of thinking.

Theoretical framework. The key components of clinical thinking are:

1. Collection and interpretation of data: complaints, medical history, physical, laboratory and instrumental examination results.
2. Formulation and verification of diagnostic hypotheses: differential diagnosis with assessment of the probability of hypotheses.
3. Decision-making: choosing the optimal treatment plan based on evidence-based medicine with a personalized approach.
4. Reflection and evaluation of the effectiveness of decisions made in the context of learning experiences (Aboulafia, 2014; Antoniv et al., 2025; Moskovko, 2016).

Therefore, the process of clinical thinking and decision-making should be associated with the best outcome for the patient, but in practice, medical errors occur.

Why does this happen?

The answer to this question lies in scientific research, in particular the theories of Müller-Lyer, Daniel Kahneman, and Amos Tversky. Mostly illogical thinking and irrational decision-making is associated with cognitive errors of systematic deviations from rational judgments. The work of famous psychologist Daniel Kahneman, "Thinking, Fast and Slow" reveals the essence of two decision-making systems (Kaneman, 2017).

System 1 (fast thinking):

– works immediately, without efforts or conscious control;

– is the result of intuitive reactions, emotions, stereotypes;

– associated with biases and frequent errors in judgment;

– used as "mental shortcuts" in familiar situations.

This system ensures that people can function effectively in everyday life without consciously analyzing details. For example: perform simple mathematical calculations; use driving skills; recognize familiar faces; respond to an unpleasant smell; read words on billboards, orientate oneself in the distance between objects etc.

Despite the numerous positive effects of the fast thinking system, its significant drawback is cognitive bias (Holloway et al., 2021).

System 2 (slow thinking):

– activates to solve complex tasks and requires conscious effort;

– implemented on the basis of logical reasoning, calculation, and conscious analysis;

– requires significant mental energy, so often "gets lazy."

Examples of the "slow thinking" system at work (complex calculations, information analysis, performing unusual tasks) demonstrate the need for complete concentration and attention, as a result, significant energy expenditure. Using System 2 for problem solving allows us to correct the impulsive judgments of System 1. However, in practice, the paradox manifests itself in our tendency to rely more often on "fast thinking," even when objectively "slow

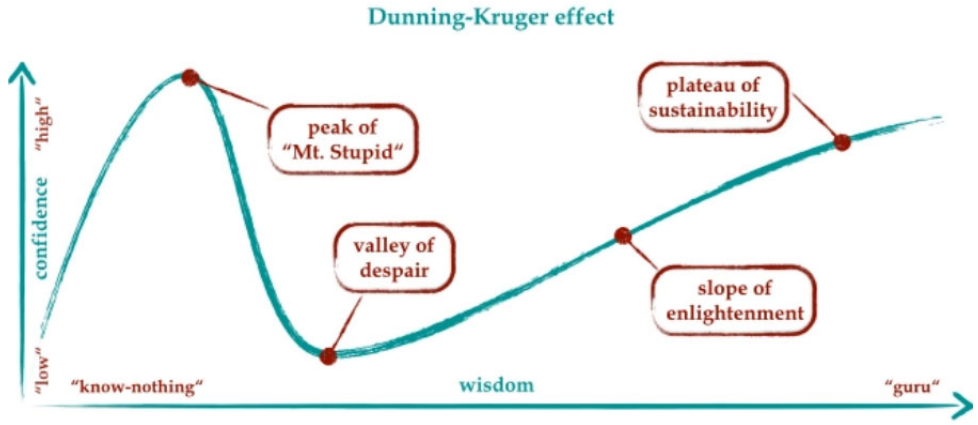

Fig. 1

thinking" would be more appropriate in a situation (Kaneman, 2017).

The organic complementarity and interaction of two systems of thinking allows doctors to significantly reduce the likelihood of unfounded decisions and, as a result, avoid mistakes, the price of which in medicine is the life and health of the patient.

So, what stands in the way of rational thinking?

The works of David Dunning, Justin Kruger, Robert Rosenthal, and many others focus on the role of cognitive errors – common "thinking traps" – as factors in irrational thinking.

The Dunning–Kruger effect describes a cognitive bias in which incompetence prevents people from recognizing their own incompetence, while highly competent professionals underestimate themselves, mistakenly believing that others have a high level of knowledge.

On the other hand, the issue of competence/incompetence as a cognitive bias can be clearly demonstrated by the example of human learning: with the acquisition of initial knowledge, self-confidence increases sharply ("peak of ignorance"), which, with the accumulation of real knowledge, decreases sharply, reaching the "valley of despair," and then gradually increases to an adequate assessment of the level of competence, in case of continuous professional development (img. 1) (Kaneman, 2017; Dymar & Yaremenko, 2024).

The negative consequences of the Dunning–Kruger effect are evident in the daily lives of both competent and incompetent individuals in decision-making, career development, communication, etc.

Studying various cognitive biases, such as the "Pygmalion effect", the "Spotlight effect", the "Blind spot bias", the "Transparency illusion", and others, allows us to understand the depth of the problem of critical thinking development and to develop effective tools for overcoming conscious biases (Kaneman, 2017).

Thus, the lack of coordinated interaction between System 1 and System 2 in medical practice is associated with systematic errors in the thinking of doctors and patients ("thinking traps") that lead to illogical judgments, misdiagnoses, and ineffective treatment, because the brain uses "shortcuts" (heuristics) for quick decision-making instead of in-depth analysis.

Here are some types of cognitive biases in medicine:

– Premature closure – the most common mistake is related to the rapid (premature) diagnosis based on the recognition of elements without considering other possible evidence;

– Representativeness error occurs when a clinician focuses on the presence or absence of classic manifestations of a disease without considering its prevalence;

– Availability bias is an underestimation of the probability of disease at the stage of incomplete examination and diagnosis based on recent (dramatic) experience or due to insufficient experience;

– Prejudice, anchoring – the clinician stubbornly clings to their initial impression, ignoring existing contradictory data;

– Authority bias (power bias) is the tendency to succumb to (obey) the influence of an authoritative person's opinion;

– Confirmation bias is the selectivity of clinical data that confirms a desired hypothesis and ignores countervailing data;

– Attribution error is associated with decision-making based on negative stereotypes, which can lead to ignoring or downplaying obvious serious illnesses;

– An affective error influences a doctor's decision based on personal feelings (positive/negative) toward the patient;

– Excessive self-confidence is a false belief in one's own competence or the correctness of one's knowledge that does not correspond to reality;

– Zemelweis reflex – a cognitive bias involving a reflexive tendency to reject new evidence or new knowledge that contradicts established norms, beliefs, or paradigms;

– Survivor bias: when focusing on successful examples, information about failures is lost and, as a result, objective reality is distorted (Kaneman, 2017).

The strategy for overcoming cognitive errors in medical practice includes a set of training techniques and procedures aimed at "removing bias" from our thinking in order to achieve the most objective medical conclusion possible, based on evidence rather than automatic errors of System 1 (Kaneman, 2017; Padalka et al., 2019).

Among the tools for developing clinical thinking, the most common are debiasing techniques, which aim to reduce bias by encouraging people to use a controlled (conscious) information processing mechanism instead of automatic processing:

– "metacognitive stop" – "switching on" System 2;

– consider the opposite – force yourself to consider alternative diagnoses;

– use of checklists in daily practice (structured approach);

– premortem – it is a "rehearsal for disaster" before it happens, allowing potential problems to be identified and prevented in advance;

– reframing – changing the wording of the task;

– temporary pause (diagnostic timeout) in mode +/–;

– collective thinking – "one head is good, but two are better";

– regular analysis of cases – keeping a personal diary of decisions.

Given the existence of external and internal factors of cognitive "thinking traps," certain rules

should be followed in the process of clinical thinking: do not make important decisions in a hurry; remember that physical overload, fatigue, and stress "shut down" System 2 thinking; base conclusions on reliable information and statistics, not emotions; constantly work on self-improvement through continuous professional development (enrich theoretical/practical knowledge); learn to "hear" opposing opinions for critical analysis of your own; use various techniques to overcome cognitive biases (Kaneman, 2017; Tsaryk, 2025).

Conclusions and prospects for further research. So, clinical thinking is a combination of analytical and intuitive thinking. It is based on a hypothetical-deductive approach and requires reflection and recognition of cognitive biases. The special role of critical thinking in medicine is related to the health and life of the patient, so it is difficult to overestimate the relevance of this issue for the medical community (Kaneman, 2017; Morozova et al., 2022).

In the context of the development of higher medical education in Ukraine, the implementation of the plan to strengthen human resources in healthcare has been made possible thanks to the support of the Swiss Agency for Development and Cooperation. Among the pilot partner higher education institutions of the Ukrainian–Swiss program is the I. Y. Gorbachevsky Ternopil National Medical University (Moskovko, 2016).

Despite serious security threats and challenges to the system in wartime, the facilitators of the "Group of equals" are creating a favorable environment for effective practices to improve medical education and develop the healthcare system.

Building a community of educators, medical students, and practicing physicians who are constantly learning and developing based on advanced international experience is a prerequisite for a comprehensive rethinking of approaches to teaching and the application of new educational tools in the formation of professional competencies, including critical thinking (Kaneman, 2017).

Funding. None.

Conflict of Interest. None.

Author Contributions. Larysa Malanchuk – Conceptualization, Methodology, Writing – Original Draft, Project Administration.

Serhiy Malanchuk – Data Curation, Supervision.

Artem Malanchuk – Investigation, Writing – Review & Editing.

All authors approved the final version of the manuscript.

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Дата першого надходження статті до видання: 11.12.2025
Дата прийняття статті до друку після рецензування: 21.01.2025
Дата публікації (оприлюднення) статті: 26.03.2026