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**ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE**

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DEVELOPMENT OF CLINICAL REASONING IN INFECTIOUS DISEASE RESIDENTS AND CLINICAL TRAINEES: THE ROLE OF CASE-BASED SIMULATION TRAINING

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✓ Resume

Background: Modern postgraduate medical education requires not only acquisition of theoretical knowledge and practical skills, but also the systematic development of clinical thinking.

Objective: To provide a scientific and methodological justification for integrated case-simulation training as a tool for developing clinical thinking in residents in infectious diseases.

Methods: The study is based on the analysis of international guidelines on competency-based medical education, including the ACGME Milestones framework, WHO educational strategies, and contemporary publications on simulation-based learning and clinical reasoning. A structured educational model integrating clinical cases, simulation scenarios, and feedback was developed.

Results: The proposed model combines syndrome-based analysis, differential diagnosis, and dynamic simulation scenarios reflecting real clinical conditions. It promotes the development of diagnostic reasoning, decision-making skills, and professional competencies. Structured feedback and debriefing were identified as key elements ensuring effective learning and self-assessment.

Conclusion: Integrated case-simulation training represents an effective and перспективный approach to the formation of clinical thinking in infectious disease residents, aligning with international standards of competency-based education.

Keywords: infectious diseases, residency training, clinical thinking, case-based learning, simulation, professional competencies, feedback

РАЗВИТИЕ КЛИНИЧЕСКОГО МЫШЛЕНИЯ У РЕЗИДЕНТОВ-ИНФЕКЦИОНИСТОВ И КЛИНИЧЕСКИХ ОРДИНАТОРОВ: РОЛЬ СИМУЛЯЦИОННОГО ОБУЧЕНИЯ НА ОСНОВЕ КЛИНИЧЕСКИХ СЛУЧАЕВ

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Современное последипломное медицинское образование требует не только приобретения теоретических знаний и практических навыков, но и систематического развития клинического мышления.

Цель: Научно-методическое обоснование интегрированного кейс-симуляционного обучения как инструмента развития клинического мышления у ординаторов по специальности "инфекционные болезни."

Методы: Исследование основано на анализе международных руководств по компетентностно-ориентированному медицинскому образованию, включая концепцию "Этапы профессионального развития" (ACGME Milestones), образовательные стратегии ВОЗ, а также современные публикации, посвященные симуляционному обучению и

клиническому мышлению. Была разработана структурированная образовательная модель, объединяющая клинические случаи, симуляционные сценарии и обратную связь.

Результаты: Предложенная модель сочетает в себе синдромный анализ, дифференциальную диагностику и динамические симуляционные сценарии, отражающие реальные клинические условия. Данная модель способствует развитию диагностического мышления, навыков принятия решений и профессиональных компетенций. Структурированная обратная связь и разбор клинического случая (дебрифинг) были определены как ключевые элементы, обеспечивающие эффективность обучения и самооценки.

Заключение: Интегрированное обучение на основе клинических случаев и симуляций представляет собой эффективный и перспективный подход к формированию клинического мышления у ординаторов-инфекционистов, что соответствует международным стандартам компетентностного образования.

Ключевые слова: инфекционные болезни, ординатура, клиническое мышление, обучение на основе клинических случаев, симуляционное обучение, профессиональные компетенции, обратная связь

ИНФЕКЦИОНИСТ-РЕЗИДЕНТЛАР ВА КЛИНИК ОРДИНАТОРЛАРДА КЛИНИК ФИКРЛАШНИ РИВОЖЛАНТИРИШ: КЛИНИК ҲОЛАТЛАР АСОСИДА СИМУЛЯЦИОН ЎҚИТИШНИНГ АҲАМИЯТИ

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✓ Резюме

Замонавий дипломдан кейинги тиббий таълим нафақат назарий билим ва амалий кўникмаларни эгаллашни, балки клиник тафаккурни тизимли ривожлантиришни ҳам талаб этади.

Мақсад: "Юқумли касалликлар" мутахассислиги бўйича ординаторларда клиник тафаккурни ривожлантириш воситаси сифатида интегратсиялашган кейс-симулятсион ўқитишни илмий-услубий жиҳатдан асослаш.

Усуллар: Тадқиқот компетенцияларга йўналтирилган тиббий таълим бўйича халқаро қўлланмаларни, жумладан "Касбий ривожланиш босқичлари" концепциясини таҳлил қилишга асосланган.

Натижалар: Таклиф этилган модель ҳақиқий клиник шароитларни аке эттирувчи синдром таҳлили, қиёсий ташиxis ва динамик симулятсия сценарийларини ўзида мужассам этган. Ушбу модель диагностик фикрлаш, қарор қабул қилиш кўникмалари ва касбий компетенцияларни ривожлантиришга ёрдам беради. Тузилмали фикр-мулоҳаза ва клиник ҳолатни таҳлил қилиш (дебрифинг) таълим ва ўз-ўзини баҳолашнинг самарадорлигини таъминловчи асосий элементлар сифатида белгиланди.

Хулоса: Клиник ҳолатлар ва симулятсияларга асосланган интегратсиялашган таълим инфекционист ординаторларда клиник тафаккурни шакллантиришга самарали ва истиқболли ёндашув бўлиб, бу халқаро компетенциявий таълим стандартларига мос келади.

Калит сўзлар: юқумли касалликлар, ординатура, клиник фикрлаш, клиник ҳолатларга асосланган таълим, симулятсион таълим, касбий компетенциялар, қайта алоқа

Relevance

Modern postgraduate medical education is increasingly oriented toward a competency - based approach, emphasizing the ability of residents to independently apply knowledge in real clinical situations. In infectious diseases, this requirement is particularly relevant due to the polymorphism of clinical manifestations, the necessity for rapid differential diagnosis, and the importance of timely decision-making.

International experience, including the ACGME framework, highlights the effectiveness of the Milestones approach, which ensures step-by-step development and assessment of professional competencies. In this context, innovative educational technologies aimed at enhancing clinical reasoning are of particular importance.

Aim of the Study The aim of this study is to substantiate the use of integrated case-simulation training as an effective tool for developing clinical thinking in residents specializing in infectious diseases.

Materials and methods

The present work is of a scientific and methodological nature. Contemporary international frameworks on competency-based medical education, the Milestones approach, and publications addressing simulation-based training and the development of clinical reasoning have been systematically analyzed. The synthesized review evidence constituted the methodological basis for assessing the advancement of modern innovative educational technologies in professional medical education.

As foundational reference points, we employed the ACGME Milestones framework, including its feedback-oriented concept, materials from the WHO Academy on lifelong learning, and publications on innovations in postgraduate medical training. In addition, review studies on the role of the educator in shaping clinical reasoning, as well as on the use of structured simulation in professional medical education, were incorporated [1, 2, 3].

Result and discussions

Case-Based Simulation Training as a Form of Active and Integrated Learning

Case-based simulation training, as a form of active learning, is grounded in a robust scientific and methodological framework in which a clinical scenario is not merely an illustration of theory, but a principal tool for developing the professional logic of clinical reasoning. Within this format, the resident does not work with a predefined diagnosis, but with a clinically realistic scenario that requires identification of the primary clinical syndrome, performance of differential diagnosis, assessment of the likelihood of an emergency condition, determination of the necessary scope of diagnostic investigations and treatment, and justification of the management strategy. Bringing the learner closer to real-life clinical situations creates conditions for the consolidation of professional competencies.

The integrative format of training infectious disease residents within this model may be reflected across several dimensions. It involves the integration of clinical, laboratory, epidemiological, and tactical components in the analysis of a given clinical case. Conditions are created both for differentiating and integrating features of adult and pediatric clinical practice. In addition, this model supports individualized learning, group-based discussion among residents, incorporation of simulation elements, and structured feedback from the mentor. This teaching methodology aligns with contemporary requirements for medical education, wherein the educational process facilitates the synthesis of knowledge with practical professional activity and fosters the development of applied competencies within the specialty.

Development of Clinical Reasoning in Infectious Diseases The formation of clinical reasoning in infectious disease residents proceeds through several sequential stages: syndromic analysis; correlation of clinical and epidemiological features; differential diagnosis; assessment of disease severity; decision-making regarding urgent interventions; selection of diagnostic pathways; and formulation of a management algorithm. In real clinical practice, situations may arise in which it is difficult for the resident to establish a definitive diagnosis, as presenting symptoms may correspond to multiple nosological entities, and an immediate diagnosis is not always feasible.

Within the case-based simulation model, the mentor observes and evaluates the learner's reasoning process in relation to the current clinical scenario. In the literature on clinical reasoning education, this aspect is considered fundamentally important: the educator's role is not that of a transmitter of content, but rather that of a facilitator who supports the development of the resident's independent clinical thinking and logical judgment. This includes creating conditions for the generation and discussion of diagnostic hypotheses, identification of potential cognitive errors, and exploration of alternative clinical decisions.

In the training of infectious disease residents, particular importance is attributed to commonly encountered clinical syndromic blocks, including: fever of unknown origin, meningal syndrome in meningitis and meningoencephalitis, exanthema, jaundice, diarrhea, tonsillitis, respiratory syndrome, thrombocytopenia, multiple organ dysfunction syndrome (MODS), disseminated intravascular coagulation (DIC), infectious toxic shock (ITS), acute liver failure, sepsis, and others. The use of clinical scenarios based on these syndromes allows for the incorporation of both adult and pediatric profiles. Such an approach enhances integration, promotes the development of diagnostic reasoning, facilitates recognition of age-specific features, and supports appropriate clinical decision-making.

Structure of the Proposed Educational Module The most rational approach for implementation is a scientifically and methodologically grounded educational module consisting of four interrelated stages.

1. Clinical Case

The resident is presented with a clinical scenario that closely approximates real-world professional practice. The clinical case is structured to include all essential contextual elements: patient complaints, medical history (including disease history, life history, and epidemiological history), objective findings, and preliminary laboratory results.

2. Independent Decision-Making

The resident independently identifies the leading clinical syndrome, formulates a range of probable nosological entities, conducts differential diagnosis, assesses the risk of complications by identifying critical symptoms, develops a diagnostic plan, and determines a preliminary management strategy.

3. Simulation Component

To reproduce the dynamics of a real clinical situation, and in accordance with the overall instructional design, the scenario may be supplemented by evolving clinical parameters, the introduction of new laboratory data, the need for consultations with subspecialists, and communication with the patient's relatives (parents, family members). In this way, a realistic clinical environment is simulated.

4. Structured Feedback and Debriefing

The instructor analyzes the resident's performance across the stages of the clinical scenario and evaluates the logic of clinical reasoning in conjunction with stepwise professional actions. This includes: comprehensive syndromic analysis; justification of differential diagnosis; appropriateness of the diagnostic plan; identification of risks and urgent conditions; adequacy and safety of investigations and therapeutic interventions; rationale for treatment choices; the ability to recognize errors; and readiness to revise incorrect hypotheses. Debriefing represents the most critical component in ensuring meaningful learning, encompassing acknowledgment of errors or confirmation of correct stepwise actions with positive outcomes, and consolidation of professional growth.

This methodology is consistent with contemporary perspectives that simulation-based training constitutes not a technical episode, but a structured educational system incorporating deliberate practice, learner self-assessment, and the recognition and correction of errors. The process is not spontaneous, but is carefully guided through facilitation strategies as required.

The Role of Structured Feedback Within the framework of competency-based medical education, feedback between the learner and the mentor is not merely a commentary on performance, but a driving force for professional development. International guidelines from the ACGME (Accreditation Council for Graduate Medical Education) recommend that residents engage in regular self-assessment, compare it with formal program-based evaluations, and track their individual professional growth over time [1], [3].

The Milestones approach, applied as a structured method for the progressive development and consolidation of key components of professional competence, is not the sole instrument for decision-making regarding learner advancement [8], [9], [10].

In the context of infectious diseases, structured feedback plays a particularly important role, enabling discussion not only of the correctness of responses, but also of the justification and logical coherence of clinical reasoning. In practice, such feedback may be organized into sequential domains: identification of the leading syndrome; coverage of relevant differential diagnoses; assessment of risks and disease severity; completeness of epidemiological data; justification of the diagnostic scope; timeliness of urgent decision-making; rationale for initial therapy; and the ability to appropriately adjust management when necessary.

Discussion Simulation-based education is recognized as an effective tool for developing professional competencies. Unlike traditional lecture-based approaches, it promotes active learning and engagement.

The integration of adult and pediatric infectious disease scenarios enhances the ability of residents to recognize both common and age-specific clinical patterns. This contributes to a more comprehensive clinical reasoning process.

The role of structured feedback is particularly important, as it allows not only evaluation of results but also analysis of the reasoning process, identification of cognitive errors, and correction of clinical decision-making.

Limitations The effectiveness of the model depends on: the quality of prepared simulation scenarios, alignment with educational objectives, instructor competence in debriefing and facilitation. Without these components, the method may lose its effectiveness.

Conclusion

The Integrated Case-Based Simulation Training Approach

The integrated case-based simulation training approach represents a scientifically and methodologically grounded tool for the development of clinical reasoning in infectious disease residents. Its educational value lies in the integration of syndrome-oriented analysis, modeling of professionally relevant clinical scenarios, cross-age (adult–pediatric) integration, progressive development of differential diagnostic reasoning, and structured feedback delivered by facilitators—namely, the instructor and mentor.

This approach to the educational process, within the context of the ongoing competency-based transformation of medical education, is перспективный and aligns with international trends, including the Milestones framework, which supports stepwise assessment of learner development and addresses authentic educational objectives. International guidelines and contemporary reviews emphasize the importance of observed learner performance, guided instruction, self-assessment (“guided debriefing,” “self-assessment”), as well as practice-oriented training models aimed at advancing the professional competence of medical specialists [4, 5, 6, 7].

Thus, the integrated case-based simulation training format represents a promising direction for the development of residency training in infectious diseases, warranting further pedagogical validation and adaptation to the specific contexts of individual educational programs [9, 10].

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