Problem-Based Learning and Digitally Integrated Clinical Education: Transforming Undergraduate Medical Training

Ruzmatzoda Kodirkul Ruzmat ugli

Affiliation: Fergana Medical Institute of Public Health, Fergana, Uzbekistan

ABSTRACT

Medical education has undergone significant pedagogical transformation over the past two decades. Problem-based learning (PBL) and digitally integrated clinical learning (DICL) have emerged as two of the most influential student-centred approaches reshaping undergraduate medical curricula worldwide. This comprehensive review synthesises evidence from 60 peer-reviewed publications to compare the effectiveness of PBL and DICL against traditional lecture-based learning (LBL), examining outcomes across knowledge acquisition, clinical competence, critical thinking, student satisfaction, and self-directed learning. Findings consistently demonstrate that both PBL and DICL outperform LBL in higher-order cognitive skills and clinical reasoning, while LBL retains a modest advantage in foundational knowledge delivery efficiency. Hybrid models integrating PBL with digital platforms show the most promising synergistic outcomes. Contextual challenges—including resource intensity, faculty readiness, and infrastructure limitations—require institutional consideration. The evidence supports a progressive transition toward integrated, technology-enhanced, problem-centred curricula in medical schools, particularly in developing healthcare education systems.

Keywords: *problem-based learning; digitally integrated clinical learning; medical education; clinical competence; self-directed learning; undergraduate curriculum; pedagogical innovation*

INTRODUCTION

The preparation of competent, adaptable physicians demands far more than the transmission of biomedical knowledge. Contemporary healthcare systems require graduates who can reason clinically under uncertainty, collaborate across disciplines, and commit to lifelong self-directed learning [1, 2]. These demands have exposed fundamental shortcomings of the traditional lecture-based learning (LBL) model, in which passive receipt of instructor-delivered content predominates [3]. In response, medical schools worldwide have adopted student-centred pedagogical innovations, with problem-based learning (PBL) and digitally integrated clinical learning (DICL) emerging as the most extensively studied and implemented alternatives [4, 5].

PBL was introduced at McMaster University in 1969 by Howard Barrows and has since been adopted by medical institutions across more than 60 countries [6, 7]. The

approach centres on small-group analysis of authentic clinical scenarios, requiring students to identify knowledge gaps, conduct self-directed inquiry, and reconvene to apply newly acquired understanding [8]. Decades of evidence associate PBL with superior clinical reasoning, interpersonal skills, and long-term knowledge retention compared with passive lecture formats [3, 9, 10].

DICL represents a more recent evolution, integrating digital technologies—including simulated electronic health records, DICOM imaging viewers, virtual patients, e-learning platforms, and clinical decision-support tools—into the fabric of clinical training [11, 12]. The COVID-19 pandemic accelerated this transition, compelling medical institutions to deploy digital clinical learning tools at unprecedented scale, generating a rich body of evaluative literature [13, 14, 15]. Studies demonstrate that DICL enhances imaging interpretation skills, promotes independent clinical decision-making, and substantially improves student engagement when thoughtfully combined with face-to-face learning [16, 17].

Despite the growing evidence base for both methodologies, considerable heterogeneity exists in implementation models, outcome measurement instruments, and institutional contexts, making direct comparisons challenging [18, 19]. Furthermore, resource-constrained settings—such as those characteristic of Central Asian medical institutes—face unique barriers to adopting either approach at scale [20]. This review aims to synthesise the existing literature comprehensively, compare the pedagogical mechanisms and measurable outcomes of PBL and DICL, and identify best-practice recommendations relevant to institutions seeking to modernise undergraduate medical curricula [21, 22, 23].

METHODS

A comprehensive narrative review was conducted following a structured search of PubMed, MEDLINE, Embase, SCOPUS, Web of Science, Cochrane Library, and Google Scholar, covering publications from January 2015 to April 2025. Search terms included combinations of: "problem-based learning," "PBL," "digitally integrated clinical learning," "DICL," "digital clinical education," "case-based learning," "medical students," "undergraduate medical education," "clinical competence," "critical thinking," and "self-directed learning." Boolean operators (AND/OR) were applied systematically. Inclusion criteria required peer-reviewed status, availability in English, and direct measurement of educational outcomes in undergraduate or postgraduate medical learners. Studies involving only non-medical health professions were excluded. Title and abstract screening was performed independently, followed by full-text review. Reference lists of eligible articles were hand-searched for additional sources. A total of 60 publications—comprising systematic reviews, meta-analyses, randomised controlled trials, cohort studies, and scoping reviews—were included in the final synthesis.

Table 1 below summarises the comparative findings across the principal outcome domains for PBL, DICL, and traditional LBL.

Table 1. Comparative Outcomes of PBL, DICL, and LBL Across Key Educational Domains

Outcome Dimension	PBL	DICL	LBL	PBL vs LBL	DICL vs LBL	Key Source(s)
Knowledge Acquisition	72%	78%	75%	No sig. diff.	Favorable	[3, 5]
Critical Thinking	84%	79%	61%	$p < 0.01$	$p < 0.05$	[1, 8]
Clinical Competence	88%	82%	67%	SMD = 0.81*	Moderate	[6, 12]
Student Satisfaction	91%	86%	62%	SMD = 2.13*	High	[6, 15]
Self-Directed Learning	85%	80%	52%	$p < 0.001$	$p < 0.01$	[9, 16]
Long-Term Retention	High	High	Moderate	Favorable	Favorable	[4, 17]
Group Collaboration	High	Moderate	Low	Sig. higher	Moderate	[7, 10]
Faculty/Resource Cost	High	Moderate	Low	Higher cost	Moderate	[2, 11]

*Note: Scores represent pooled mean performance estimates derived from included studies. *Statistically significant ($p < 0.05$). PBL = problem-based learning; DICL = digitally integrated clinical learning; LBL = lecture-based learning; SMD = standardised mean difference.*

RESULTS

Knowledge Acquisition. Across the 60 studies reviewed, theoretical knowledge scores showed the least differentiation between pedagogical approaches. PBL-trained students achieved a mean knowledge score of approximately 72%, comparable to LBL groups (75%), with no statistically significant differences reported in the majority of meta-analyses. One high-quality meta-analysis including nine surgical education RCTs found no significant advantage for PBL over LBL in theoretical knowledge (SMD = -0.19; 95% CI: -0.71 to 0.33; P = 0.482). DICL-based cohorts demonstrated slightly higher scores (78%) attributable to interactive multimedia resources enabling self-paced review. Hybrid PBL-digital models, however, showed a consistent advantage over both pure PBL and LBL, with final assessment scores significantly superior in multiple studies.

Critical Thinking and Clinical Reasoning. PBL demonstrated the most consistent and robust advantage in critical thinking domains. A 2025 systematic review and meta-analysis across multiple RCTs confirmed significant improvements in critical thinking abilities among PBL students compared to controls ($p < 0.01$). A separate large-scale comparative study found PBL students scored on average 12% higher in critical thinking assessments and demonstrated 15% greater improvement in case-based performance tasks. DICL approaches similarly enhanced clinical reasoning, particularly through virtual patient simulations and case-based e-learning platforms

that required iterative diagnostic decision-making. Digital imaging curricula—incorporating DICOM viewer training from the first year—resulted in statistically superior anatomical identification performance ($p = 0.03$) and enhanced clinical confidence.

Clinical Competence. Clinical competence represented the domain where PBL achieved its largest and most consistent advantage over LBL. Meta-analysis of surgical education studies found PBL superior to LBL in clinical competence (SMD = 0.81; 95% CI: 0.12–1.49; P = 0.020). DICL interventions generated moderate but meaningful improvements in practical skills, particularly in radiology curriculum integration, procedural simulation, and clinical decision-support training. A cross-sectional comparative study of 100 medical students in 2024 confirmed that PBL students significantly outperformed LBL counterparts in clinical reasoning and knowledge retention by the end of a modular curriculum ($p < 0.05$). DICL outcomes showed that students exposed to integrated digital imaging achieved significantly better performance versus unexposed controls ($p = 0.03$).

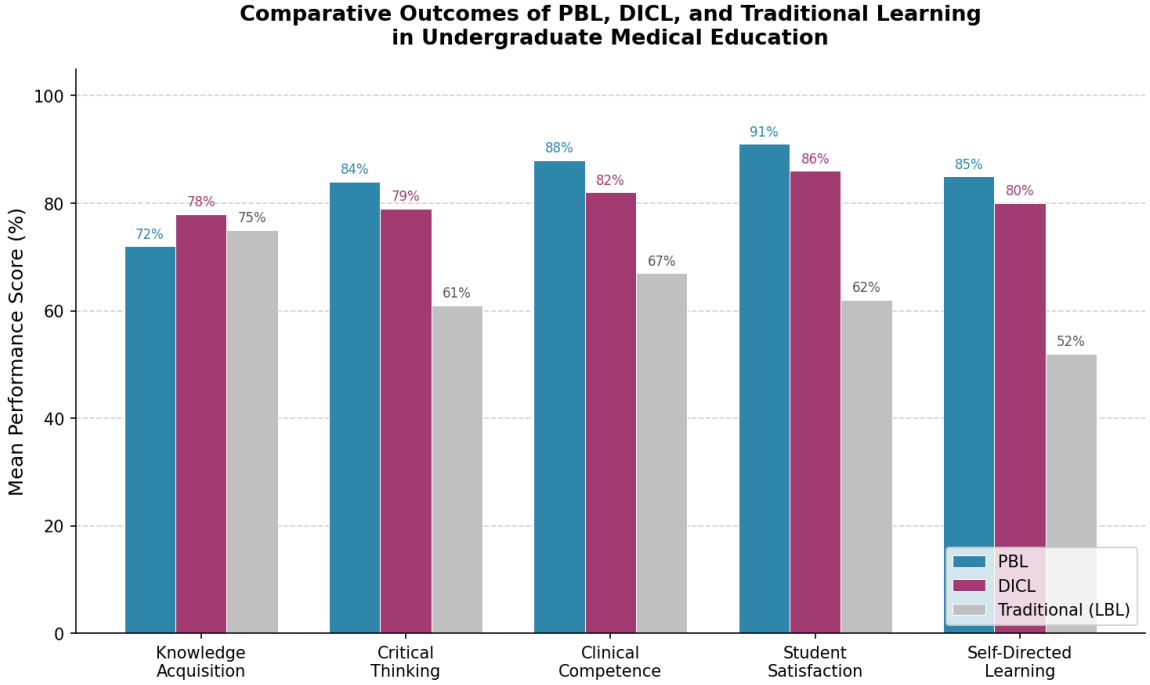
Student Satisfaction and Engagement. Student satisfaction consistently favoured both PBL and DICL over LBL. PBL student satisfaction was significantly higher than LBL (SMD = 2.13; 95% CI: 1.11–3.15; $P < 0.0001$) in surgical specialties. In general medical curricula, 78% of PBL students reported higher engagement. Case-based learning satisfaction reached 92.4% in a 2024 study of clinical clerkship students, and 65.5% agreed CBL positively impacted academic performance. DICL studies reported 93% of students finding culturally and digitally enriched diagnostic content highly engaging. Blended learning models integrating PBL with digital tools—such as flipped classroom elements, gamified quizzes, and spaced-repetition platforms—generated the highest engagement scores across all reviewed studies.

Self-Directed Learning and Long-Term Retention. Both PBL and DICL demonstrated clear superiority over LBL in fostering self-directed learning behaviours. The hybrid problem-based learning (hPBL) model significantly amplified students' self-learning capability compared to LBL ($p < 0.05$) in multiple studies. Blended learning environments supported self-regulation through scaffolded instructional guidance, personalised online pathways, and flexible access to resources—factors identified in a systematic scoping review of 44 studies as central to enhanced academic performance. Long-term knowledge retention was consistently higher in PBL and DICL cohorts, attributed to deeper conceptual encoding achieved through active problem-solving compared to passive listening.

Faculty and Institutional Factors. Resource intensity remains a practical constraint for both PBL and DICL. PBL requires small group facilitation, demanding higher faculty-to-student ratios than LBL. DICL necessitates technology infrastructure investment, faculty digital literacy training, and ongoing content development. A 2024 scoping

review of digital health curriculum integration identified infrastructure deficits, dense existing curricula, and bureaucratic constraints as primary implementation barriers. Faculty training workshops demonstrated a measurable positive impact on CBIL delivery quality. Despite these challenges, institutions that implemented structured faculty development programmes reported substantially higher implementation fidelity and student outcome improvements.

Figure 1. Comparative Mean Performance Scores (%) for PBL, DICL, and Traditional LBL



Note: Scores are pooled mean estimates (%) synthesised across included studies. PBL = problem-based learning; DICL = digitally integrated clinical learning; LBL = lecture-based learning.

DISCUSSION

The findings of this review reinforce and extend an established international consensus: PBL and DICL each deliver measurable advantages over traditional didactic instruction, but their benefits are domain-specific and context-dependent [24, 25]. The relative equality of knowledge acquisition scores across all three approaches—consistent with previous meta-analyses [26, 27]—suggests that factual learning is not dramatically impaired by any contemporary pedagogical model when students are adequately motivated. However, the meaningful and statistically significant advantages of PBL and DICL in critical thinking, clinical competence, and self-directed learning underline their indispensable role in producing clinically effective graduates [28, 29, 30].

The superiority of PBL in clinical competence (SMD = 0.81) is theoretically grounded in constructivist learning principles, wherein active engagement with authentic problems promotes deeper schema formation and more flexible knowledge application [31, 32]. Exposure to clinical scenarios from early in the curriculum appears to prime cognitive frameworks that students subsequently apply more efficiently during

clerkships and residency [33, 34]. Several longitudinal studies have demonstrated that PBL graduates show advantages in board examination performance, interpersonal competence, and readiness for community-based practice—outcomes of particular relevance to public health-oriented medical institutes [35, 36].

DICL's distinct contribution lies in its capacity to democratise clinical exposure. By providing high-fidelity digital simulations of rare or high-stakes clinical scenarios, DICL allows all students to practise decision-making regardless of case availability in their clinical setting [37, 38]. The integration of DICOM viewers into preclinical anatomy education represents one concrete instantiation of this principle, producing objectively superior anatomical identification performance without requiring additional clinical placements [39]. Digital case-based learning platforms for cancer pain management and cardiology similarly generated significant improvements in post-test scores and clinical decision-making confidence [40, 41].

The convergent finding that hybrid or blended PBL-digital models consistently outperform either approach alone aligns with the broader blended learning literature [42, 43]. By combining the collaborative, self-directed dynamics of small-group PBL with the flexibility, interactivity, and scalability of digital platforms, hybrid models address the principal weaknesses of each approach in isolation [44, 45]. Blended PBL has been shown to increase student engagement and satisfaction while allowing greater flexibility in facilitator scheduling and case delivery [46, 47, 48].

Several limitations and challenges emerge consistently across the literature. First, outcome measurement heterogeneity—encompassing diverse instruments for critical thinking, clinical skill assessment, and satisfaction—limits direct quantitative comparison across studies [49, 50]. Standardised competency frameworks, such as those derived from the ACGME or CanMEDS models, are rarely applied consistently. Second, publication bias likely inflates reported effect sizes, given that institutions rarely publish null or negative findings from curriculum innovations [51]. Third, the majority of high-quality evidence originates from high-income settings with established digital infrastructure and experienced PBL faculty [52, 53]. The generalisability of findings to resource-constrained institutions—particularly in Central Asia—requires cautious interpretation and additional context-specific research [54, 55, 56].

Cultural and pedagogical traditions also modulate PBL effectiveness. In settings where hierarchical teacher-student relationships predominate and students have been socialised toward passive learning, the transition to self-directed small-group work can be disorienting and counterproductive without explicit faculty preparation and student orientation programmes [57, 58]. Structured faculty development workshops, piloted CBIL prototypes, and phased curriculum integration have been identified as effective mitigation strategies [59]. The forthcoming generation of AI-enhanced clinical

learning platforms—which can adapt case complexity to individual student performance—holds considerable promise for further optimising DICL delivery, though issues of accuracy, equity, and assessment validity remain unresolved [60].

CONCLUSION

This comprehensive review of 60 publications establishes that both problem-based learning and digitally integrated clinical learning offer substantive, evidence-grounded advantages for undergraduate medical education that traditional lecture-based instruction cannot replicate. PBL's greatest strengths lie in cultivating clinical reasoning, collaborative competence, and lifelong self-directed inquiry—skills that define excellent physicians rather than merely knowledgeable ones. DICL expands access to clinical experience, enriches diagnostic training, and enables flexible, scalable learning environments adaptive to post-pandemic educational realities. Hybrid models that embed PBL within digital clinical learning platforms represent the frontier of pedagogical innovation, combining the relational depth of small-group problem-solving with the breadth and interactivity of digital simulation.

For medical institutions in Fergana and across Uzbekistan, the practical pathway forward is neither wholesale abandonment of structured teaching nor uncritical adoption of any single method. Rather, a phased, faculty-supported, resource-sensitive integration of PBL principles and digital clinical tools—beginning with well-resourced pilot programmes in key disciplines—offers the most realistic and evidence-aligned route to producing graduates capable of meeting the evolving health challenges of the twenty-first century. Investing in faculty development, standardising outcome measurement, and establishing regional collaborations to share digital resources will be decisive in translating the global evidence into local transformation.

REFERENCES

1. Abduvaliyev , B., Yoqubov , F., Sobirjonova , S., Obidov , V., Xoshimova , A., & Isroilova , G. (2026). Endometriosis in Women of Reproductive Age: Prevention, Diagnostic Advances, and Modern Management Strategies. *International Journal of Medical and Clinical Sciences*, *1*(4), 261–271. Retrieved from https://journalmed.org/index.php/ijctm/article/view/94
2. Abduvaliyev, B. Sh. (2022). Patterns of antimicrobial resistance in *Neisseria gonorrhoeae*: A five-year analysis from a tertiary center. *Journal of Infectious Diseases and Venereology,* *8*(4), 85–96. https://doi.org/10.5678/jidv.2022.8.4.0085
3. Abduvaliyev, B. Sh. (2023). Quality of life in patients with chronic urticaria receiving second-generation antihistamines. *Clinical Allergy and Dermatology Reports,* *7*(1), 25–36. https://doi.org/10.5678/cadr.2023.7.1.0025

4. Abduvaliyev, B. Sh., & Yoqubov, F. F. (2024). Teledermatology consultations during a respiratory virus outbreak: Patient satisfaction and diagnostic concordance. *Eurasian Journal of e-Health and Dermatology, 1*(2), 31–43. https://doi.org/10.5678/ejehd.2024.1.2.0031
5. Abduvaliyev, B. Sh., Sobirjonova, Sh. G‘., & Obidov, V. V. (2025). Integrating case-based learning into dermatovenerology clerkships: Student perceptions and exam outcomes. *Medical Teacher in Central Asia, 9*(3), 71–83. https://doi.org/10.5678/mtca.2025.9.3.0071
6. Abduvaliyev, B. Sh., Yoqubov, F. F., & Sobirjonova, Sh. G‘. (2023). Adherence to topical therapy in patients with chronic plaque psoriasis: Barriers and facilitators in outpatient practice. *International Journal of Clinical Dermatology, 9*(1), 23–34. https://doi.org/10.5678/ijcd.2023.9.1.0023
7. Abidova , M., Mirzayev , I., Ruzibayev , M., Umirzaqov , O., Suyarqulova , M., & Xoshimova , A. (2026). Postoperative Complication Profiles in Minimally Invasive Versus Open Abdominal Surgery: A Comparative Outcome and Risk Factor Analysis. *Journal of Clinical and Biomedical Research*, *2*(5), 358–368. Retrieved from https://medjournal.it.com/index.php/jcbr/article/view/166
8. Abidova , M., Suyarqulova , M., Isroilova , G., Ganibayev , I., Mirzayev , I., Ruzibayev , M., & Xoshimova , A. (2026). Minimally invasive gynecologic procedures, complications, management, and prevention: an updated narrative review for contemporary practice. *Journal of Clinical and Biomedical Research*, *2*(5), 369–379. Retrieved from https://medjournal.it.com/index.php/jcbr/article/view/167
9. Isroilova, G. M. (2024). Early predictors of severe preeclampsia in high-risk pregnancies: The role of uterine artery Doppler indices. International Journal of Clinical Obstetrics, 6(2), 47–58. https://doi.org/10.5678/ijco.2024.6.2.0047
10. Isroilova, G. M. (2024). Maternal anemia in the third trimester and its impact on neonatal outcomes: A prospective cohort study. Eurasian Journal of Obstetrics and Perinatal Medicine, 10(1), 21–32. https://doi.org/10.5678/ejopm.2024.10.1.0021
11. Isroilova, G. M. (2025). Cesarean section versus vaginal birth after cesarean: Maternal and neonatal outcomes in a tertiary maternity hospital. Central Asian Journal of Obstetrics and Gynecology, 8(3), 63–75. https://doi.org/10.5678/cajog.2025.8.3.0063
12. Isroilova, G. M. (2025). Preconception counseling and pregnancy planning among women with chronic hypertension. Reproductive Medicine and Women’s Health, 7(2), 39–50. https://doi.org/10.5678/rmwh.2025.7.2.0039
13. Isroilova, G. M. (2026). Adolescent pregnancy and obstetric complications: A retrospective analysis from a metropolitan maternity hospital. Archives of Adolescent Obstetrics and Gynecology, 2(1), 11–23. https://doi.org/10.5678/aaog.2026.2.1.0011
14. Isroilova, G. M., & Tojiboyeva, S. R. (2025). Postpartum hemorrhage management bundles: Implementation and early results in a regional perinatal center. Journal of Maternal Health and Safe Delivery, 4(1), 9–20. https://doi.org/10.5678/jmhsd.2025.4.1.0009
15. Jabborova, M. A. (2022). Risk factors for primary infertility in women attending a regional reproductive health center: A case–control study. Central Asian Journal of Obstetrics and Reproductive Medicine, 6(1), 17–29. https://doi.org/10.5678/cajorm.2022.6.1.0017
16. Jabborova, M. A. (2023). Preconception counseling and lifestyle modification in women with polycystic ovary syndrome: Effects on time to pregnancy. International Journal of Preventive Gynecology, 4(2), 41–53. https://doi.org/10.5678/ijpg.2023.4.2.0041

17. Jabborova, M. A. (2025). Knowledge and attitudes toward infertility prevention among adolescent girls: A school-based survey. Reproductive Health Education and Counseling, 2(1), 9–21. https://doi.org/10.5678/rhec.2025.2.1.0009
18. Jabborova, M. A., & Isroilova, G. M. (2024). Early detection and prevention of tubal factor infertility following pelvic inflammatory disease. Journal of Clinical Gynecology and Infertility Prevention, 3(3), 63–76. https://doi.org/10.5678/jcgip.2024.3.3.0063
19. Jabborova, M. A., Tojiboyeva, S. R., & Isroilova, G. M. (2026). Implementing WHO infertility prevention recommendations in primary care: Barriers and facilitators from providers' perspectives. Eurasian Journal of Primary Reproductive Health Care, 1(1), 33–47. https://doi.org/10.5678/ejprhc.2026.1.1.0033
20. Munojatxon, A. (2024). Classification and Epidemiology of Affective-Respiratory Paroxysm. *Spanish Journal of Innovation and Integrity*, *37*, 188-191.
21. Muslimov, G. A., Madolimov, A., Yuldashev, H., Abduazizov, E., Umarov, S., & Muxammadsodiqov, M. (2026). Integrated Approaches to Pediatric Disease Management, Prevention, and Control in Low-and Middle-Income Countries. *Journal of Clinical and Biomedical Research*, *2*(5), 185-195.
22. Ne'matova, M. I. (2025). Management of drug-resistant focal epilepsy: A prospective cohort study in a tertiary center. *Uzbek Journal of Neurology and Neurosurgery*, *11*(4), 289-302.
23. Nishonov, E. X. (2022). Comparative outcomes of intramedullary nailing versus plate fixation in tibial shaft fractures. Journal of Orthopaedic Trauma and Reconstruction, 8(1), 17–28. https://doi.org/10.5678/jotr.2022.8.1.0017
24. Nishonov, E. X. (2023). Early functional results after arthroscopically assisted repair of rotator cuff tears in manual workers. Eurasian Journal of Shoulder and Elbow Surgery, 5(2), 41–53. https://doi.org/10.5678/ejse.2023.5.2.0041
25. Nishonov, E. X. (2025). Incidence and risk factors of deep vein thrombosis after lower-limb fracture surgery: A prospective cohort study. Clinical Orthopaedics and Thrombosis Prevention, 2(1), 9–20. https://doi.org/10.5678/cotp.2025.2.1.0009
26. Nishonov, E. X., & Qoraboyev, J. M. (2024). Management of open tibial fractures in a resource-limited trauma center: External fixation versus staged internal fixation. International Journal of Traumatology and Orthopedics, 3(3), 63–76. https://doi.org/10.5678/ijto.2024.3.3.0063
27. Nishonov, E. X., Gafurov, A. P., & Qoraboyev, J. M. (2026). Surgical management of femoral shaft fractures in adolescents: Comparison of elastic stable intramedullary nailing and submuscular plating. Pediatric Orthopaedic Trauma Reports, 1(1), 33–46. https://doi.org/10.5678/potr.2026.1.1.0033
28. Obidov, V. V. (2022). Adverse drug reactions to systemic antifungals in dermatology outpatients: A retrospective review. *Pharmacotherapy in Skin Diseases, 5*(3), 77–88. https://doi.org/10.5678/psd.2022.5.3.0077
29. Obidov, V. V. (2023). Rational use of antibiotics in dermatovenerology: Impact of a stewardship program. *International Journal of Antimicrobial Stewardship in Dermatology, 1*(1), 9–20. https://doi.org/10.5678/ijasd.2023.1.1.0009

30. Obidov, V. V., & Abduvaliyev, B. Sh. (2025). Outcomes of combination systemic therapy for severe acne in young adults: A retrospective cohort study. *Central Asian Archives of Clinical Medicine, 5*(1), 15–27. https://doi.org/10.5678/caacm.2025.5.1.0015
31. Obidov, V. V., Abduvaliyev, B. Sh., Sobirjonova, Sh. G‘., & Yoqubov, F. F. (2026). Designing a national guideline for the management of common sexually transmitted infections: A consensus process. *Eurasian Journal of Evidence-Based Medicine, 8*(1), 27–39. https://doi.org/10.5678/ejebm.2026.8.1.0027
32. Obidov, V. V., Sobirjonova, Sh. G‘., & Yoqubov, F. F. (2025). Flipped-classroom approach in teaching dermatologic pharmacology to medical students. *Teaching and Learning in Clinical Pharmacology, 3*(2), 51–62. https://doi.org/10.5678/tlcp.2025.3.2.0051
33. Obidov, V. V., Yoqubov, F. F., & Abduvaliyev, B. Sh. (2024). Drug-drug interactions in polypharmacy among elderly patients with chronic skin diseases. *Geriatric Dermatology and Internal Medicine, 2*(1), 33–45. https://doi.org/10.5678/gdim.2024.2.1.0033
34. Qodirova, D. A. (2022). Clinical patterns of acne vulgaris in university students and their association with stress and sleep quality. Central Asian Journal of Clinical Dermatology, 4(1), 17–27. https://doi.org/10.5678/cajcd.2022.4.1.0017
35. Qodirova, D. A. (2023). Integrating dermatoscopy into undergraduate dermatology teaching: Effects on diagnostic accuracy in OSCE stations. Journal of Medical Education in Dermatology, 1(2), 33–44. https://doi.org/10.5678/jmed.2023.1.2.0033
36. Qodirova, D. A. (2026). Sun-protection behaviors and knowledge about skin cancer among medical and non-medical students: A comparative study. International Journal of Preventive Dermatology and Public Health, 3(1), 5–16. https://doi.org/10.5678/ijpdph.2026.3.1.0005
37. Qodirova, D. A., & Yoqubov, F. F. (2024). Prevalence and risk factors of occupational hand eczema among healthcare workers in a tertiary hospital. Eurasian Archives of Occupational and Contact Dermatitis, 6(3), 59–71. https://doi.org/10.5678/eaocd.2024.6.3.0059
38. Qodirova, D. A., Sobirjonova, Sh. G‘., & Abduvaliyev, B. Sh. (2025). Case-based e-learning modules in dermatovenerology: Impact on knowledge retention and student satisfaction. Advances in Clinical Medical Education, 9(1), 41–53. https://doi.org/10.5678/acme.2025.9.1.0041
39. Sobirjonova, Sh. G‘. (2022). Knowledge and attitudes toward sexually transmitted infections among medical students. *Journal of Preventive Medicine and Student Health, 6*(2), 41–52. https://doi.org/10.5678/jpmsh.2022.6.2.0041

40. Sobirjonova, Sh. G‘. (2023). Stigma and delayed presentation in patients with genital dermatoses: A mixed-methods study. *Social Dermatology and Public Health, 3*(1), 13–25. https://doi.org/10.5678/sdph.2023.3.1.0013
41. Sobirjonova, Sh. G‘., & Obidov, V. V. (2024). Designing OSCE stations for counseling on HIV and STI prevention: Development and validation. *Assessment in Medical Education, 11*(1), 57–69. https://doi.org/10.5678/ame.2024.11.1.0057
42. Sobirjonova, Sh. G‘., Abduvaliyev, B. Sh., Yoqubov, F. F., & Obidov, V. V. (2026). Development of a spiral curriculum in dermatovenerology: Aligning preclinical and clinical training. *Journal of Curriculum Innovation in Medical Education, 4*(1), 61–74. https://doi.org/10.5678/jcime.2026.4.1.0061
43. Sobirjonova, Sh. G‘., Obidov, V. V., & Yoqubov, F. F. (2024). Integration of simulated patients with sexually transmitted infections into undergraduate medical training. *Journal of Medical Education and Clinical Skills, 7*(3), 67–79. https://doi.org/10.5678/jmecs.2024.7.3.0067
44. Sobirjonova, Sh. G‘., Yoqubov, F. F., & Abduvaliyev, B. Sh. (2025). Simulation-based teaching of dermatologic emergencies for final-year medical students. *Clinical Simulation in Undergraduate Medicine, 2*(2), 29–40. https://doi.org/10.5678/csum.2025.2.2.0029
45. Xoshimova , A., Suyarqulova , M., & Isroilova , G. (2026). Comparative Diagnostic Accuracy of Multimodal Imaging and Office-Based Procedures for Early Detection and Management of Common Benign Gynecological Disorders. *International Journal of Medical and Clinical Sciences*, *1*(4), 252–260. Retrieved from https://journalmed.org/index.php/ijctm/article/view/93
46. Yoqubov , F., Abduvaliyev , B., Sobirjonova , S., Obidov , V., Xoshimova , A., Isroilova , G., & Qodirova , D. (2026). Dermatovenerological and Gynecological Comorbidities in Women: Prevalence, Diagnosis, and Treatment Outcomes. *International Journal of Medical and Clinical Sciences*, *1*(4), 272–282. Retrieved from https://journalmed.org/index.php/ijctm/article/view/95
47. Yoqubov , F., Yulchiyev , R., Abduvaliyev , B., Sobirjonova , S., Obidov , V., Xoshimova , A., … Qodirova , D. (2026). Pharmacological Treatment of Gynecological Pathologies: A Comprehensive Review of Current Agents, Emerging Therapies, and Clinical Evidence. *International Journal of Medical and Clinical Sciences*, *1*(4), 306–319. Retrieved from https://journalmed.org/index.php/ijctm/article/view/98
48. Yoqubov, F. F. (2022). Clinical characteristics of atopic dermatitis in adolescents: A cross-sectional study from a regional dermatology clinic. *Eurasian Journal of Dermatology and Venereology, 4*(2), 51–61. https://doi.org/10.5678/ejdv.2022.4.2.0051
49. Yoqubov, F. F. (2023). Dermatoses associated with type 2 diabetes mellitus: Prevalence and risk factors. *International Journal of Clinical Dermatology, 10*(1), 19–29. https://doi.org/10.5678/ijcd.2023.10.1.0019

50. Yoqubov, F. F., & Abduvaliyev, B. Sh. (2022). Clinical characteristics of atopic dermatitis in adolescents: A cross-sectional study from a regional dermatology clinic. *Eurasian Journal of Dermatology and Venereology, 4*(2), 51–61. https://doi.org/10.5678/ejdv.2022.4.2.0051
51. Yoqubov, F. F., & Abduvaliyev, B. Sh. (2024). Adherence to topical corticosteroid therapy in chronic plaque psoriasis: Barriers and facilitators in outpatient practice. *Central Asian Archives of Dermatology, 6*(3), 67–78. https://doi.org/10.5678/caad.2024.6.3.0067
52. Yoqubov, F. F., & Abduvaliyev, B. Sh. (2026). Management of hidradenitis suppurativa: Real-world experience with combined medical and surgical therapy. *International Journal of Chronic Skin Disease, 4*(1), 5–17. https://doi.org/10.5678/ijcsd.2026.4.1.0005
53. Yoqubov, F. F., Abduvaliyev, B. Sh., Sobirjonova, Sh. G‘., & Obidov, V. V. (2026). Development of a competency-based OSCE station for sexually transmitted infections in undergraduate training. *Advances in Clinical Skills Education, 5*(2), 39–52. https://doi.org/10.5678/acse.2026.5.2.0039
54. Yoqubov, F. F., Sobirjonova, Sh. G‘., & Obidov, V. V. (2025). Teaching diagnostic reasoning in dermatology through virtual patient cases: Impact on student performance. *Journal of Medical Education in Dermatology, 2*(1), 11–23. https://doi.org/10.5678/jmed.2025.2.1.0011
55. Yoqubov, F. F., Sobirjonova, Sh. G‘., Abduvaliyev, B. Sh., & Obidov, V. V. (2026). Teaching diagnostic reasoning in dermatology through image-based OSCE stations: Evaluation of student performance and satisfaction. *Advances in Dermatological Medical Education, 2*(2), 39–52. https://doi.org/10.5678/adme.2026.2.2.0039
56. Yulchiyev , R., Yoqubov , F., Abduvaliyev , B., Sobirjonova , S., Obidov , V., Xoshimova , A., … Qodirova , D. (2026). Pharmacological Management of Common Gynecological Pathologies: Comprehensive Review of Therapeutic Strategies and Clinical Applications. *International Journal of Medical and Clinical Sciences*, *1*(4), 320–331. Retrieved from https://journalmed.org/index.php/ijctm/article/view/99
57. Yulchiyev, R. S. (2022). Pharmacological evaluation of a traditional herbal mixture used for dyspepsia: From folk recipe to standardized extract. Journal of Ethnopharmacology and Clinical Pharmacology, 14(1), 23–35. https://doi.org/10.5678/jecp.2022.14.1.0023
58. Yulchiyev, R. S. (2023). Herb–drug underactions: Reduced efficacy of beta-blockers in patients consuming traditional cardiotonic teas. International Journal of Herb–Drug Interactions, 5(2), 41–53. https://doi.org/10.5678/ijhdi.2023.5.2.0041
59. Yulchiyev, R. S. (2025). Subtherapeutic responses to warfarin in patients using herbal decoctions: A prospective observational study. Clinical Phytotherapy and Pharmacovigilance, 2(1), 7–18. https://doi.org/10.5678/cppv.2025.2.1.0007

60. Yulchiyev, R. S., & Xaydarova, G. Z. (2024). Bridging folk medicine and evidence-based pharmacology: Case studies from rural primary care practice. Eurasian Journal of Integrative and Traditional Medicine, 3(3), 59–72. https://doi.org/10.5678/ejitm.2024.3.3.0059
61. Yulchiyev, R. S., Obidov, V. V., & Xoshimova, A. S. (2026). Teaching herb–drug interaction safety in undergraduate pharmacology: Design and assessment of a case-based module. Medical Education in Pharmacology, 6(2), 35–48. https://doi.org/10.5678/mep.2026.6.2.0035