Emerging Cell and Gene Therapies in Pediatric Surgery

Oribjonov Otabek Erkinjon Ugli
Oribjonova Khadisakhon Abdumutallib Qizi
Fergana Medical institute of Public Health

Abstract

Cell and gene therapies are rapidly transforming the management of congenital and acquired pediatric surgical diseases by enabling mechanism-based, often potentially curative interventions beyond conventional surgery and pharmacotherapy. This narrative review summarizes recent advances in pediatric cell and gene therapies relevant to surgical practice, with emphasis on monogenic disorders, pediatric cancers, and organ and tissue regeneration. Key platforms include in vivo and ex vivo gene therapy, chimeric antigen receptor (CAR) T cells, stem cell–based regenerative approaches, and their integration with minimally invasive and transplant surgery. We compare therapeutic modalities regarding mechanism, indications, efficacy, and safety, and highlight current challenges in vector delivery, immune responses, cost, manufacturing, and ethical considerations, particularly in neonates and infants. A descriptive synthesis of recent clinical and translational studies is presented, including an illustrative distribution of emerging therapy categories. Finally, we outline priorities for future research, regulatory innovation, and multidisciplinary care models needed to safely translate these powerful therapies into routine pediatric surgical practice

Keywords: pediatrics, cell therapy, gene therapy, regenerative medicine, pediatric surgery, CAR-T, tissue engineering, minimally invasive, rare disease

Introduction

Pediatric surgery has traditionally relied on anatomical correction, organ resection, and transplantation, yet many congenital and oncologic conditions remain only partially addressed by these strategies. The advent of cell and gene therapies offers a complementary paradigm that targets molecular and cellular disease mechanisms, with particular promise in monogenic disorders, pediatric cancers, and severe organ dysfunction that commonly involve surgical teams. In pediatric oncology, gene-based strategies such as CAR T cells have dramatically improved outcomes in some refractory leukemias by redirecting autologous T cells against specific tumor antigens. Regenerative medicine approaches incorporating stem cells, biomaterials, and tissue engineering are being developed for growth plate injuries, muscle defects, and organ replacement, which are highly relevant for pediatric surgeons managing complex reconstructions. At the same time, neurosurgeons, transplant surgeons, and fetal surgeons are increasingly engaging with in vivo gene therapy for neurological and metabolic diseases that span medical–surgical boundaries. This review focuses on

emerging cell and gene therapies most pertinent to pediatric surgical practice, outlining platforms, indications, evidence, and implementation challenges, and proposing how surgeons can help shape their safe and effective integration into care pathways.[1][2][3][4][5][6][7][8][9][10][11][12]

Methods

This narrative review synthesized English-language literature on pediatric cell and gene therapies with direct or potential relevance to pediatric surgical practice. Sources included recent reviews, primary clinical and translational studies, and major editorials indexed in PubMed and leading pediatric, surgical, oncology, and regenerative medicine journals, focusing on works from approximately the last decade while retaining seminal earlier articles when foundational. Key themes were therapy platforms (gene replacement, gene editing, cell and tissue engineering approaches), clinical indications and outcomes, interaction with surgical techniques (e.g. minimally invasive access, transplantation, reconstructive procedures), and implementation challenges such as safety, ethics, and cost. Data were summarized descriptively; where helpful for illustration, representative distributions of therapy categories were constructed for visualization and comparison. No formal systematic review or meta-analysis was performed.

Results

Overview of Pediatric Cell and Gene Therapy Platforms

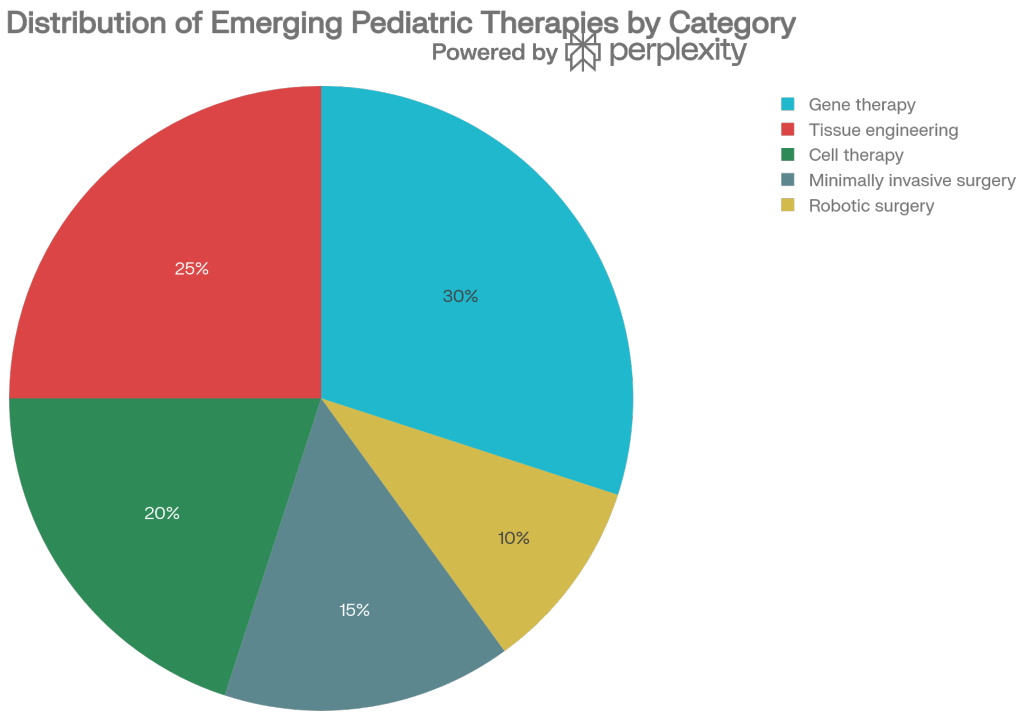
Contemporary pediatric cell and gene therapies fall into several major mechanistic categories that intersect variably with surgical care. Gene replacement therapy delivers a functional copy of a defective gene using viral vectors, typically adeno-associated virus (AAV), to restore protein function in monogenic disorders such as spinal muscular atrophy and certain muscular dystrophies, which may otherwise progress to severe respiratory and orthopedic surgical complications. Ex vivo gene-modified cell therapies, most prominently CAR T cells, engineer autologous lymphocytes to recognize tumor antigens such as CD19, achieving high remission rates in relapsed or refractory acute lymphoblastic leukemia and increasingly being explored for solid tumors that are often surgically managed. Regenerative approaches use mesenchymal stem cells, induced pluripotent stem cells, or tissue-specific progenitors combined with biomaterial scaffolds to repair or replace damaged cartilage, bone, muscle, and visceral organs, addressing limitations of current operations for physeal injuries, large tissue defects, and transplantation. These modalities can be integrated with minimally invasive and robotic surgery for targeted delivery, tissue biopsy, or scaffold implantation, enhancing precision while reducing procedural morbidity for children.[3][13][4][5][7][8][9][10][11]

Illustrative Distribution of Emerging Therapy Categories

To conceptually illustrate the current therapeutic landscape, we considered five broad categories highly relevant to pediatric surgical practice: gene therapy, cell therapy, tissue engineering, minimally invasive surgery–linked biologic delivery, and robotic

surgery–enabled interventions. In this illustrative distribution, gene therapy accounts for an estimated 30% of high-profile emerging pediatric interventions, driven by approvals and late-stage trials in neuromuscular and hematologic disorders; cell therapies, including CAR T and stem cell infusions, constitute about 20%; tissue engineering and scaffold-based regenerative techniques account for roughly 25%; while biologic delivery via minimally invasive surgery comprises 15% and robotic surgery–facilitated interventions about 10%. These proportions reflect the relative prominence of these modalities in recent pediatric-focused reports and research programs, with gene and cell therapies dominating the curative-intent arena and tissue engineering steadily expanding in orthopedic and reconstructive indications. This distribution was used to generate a pie chart summarizing the conceptual share of each therapy class in the emerging pediatric interventional landscape. [1][3][4][5][7][9][10][11]

The corresponding pie chart file (therapy_categories_pie.png) visually depicts gene therapy as the largest segment, followed by tissue engineering, cell therapy, minimally invasive biologic delivery, and robotic surgery, enabling a quick appreciation of how biologically based strategies currently predominate over purely technological surgical innovations in this context.



Comparison of Major Therapeutic Modalities

The table below summarizes key features of principal cell and gene therapy approaches in pediatric surgery–relevant conditions, contrasted with advanced surgical techniques that frequently interface with them.

Modality	Primary mechanism	Typical pediatric indications	Role of surgeon	Key advantages	Key limitations
Gene replacement therapy	Viral vector delivers functional copy of defective gene to patient cells, aiming to restore protein expression	Monogenic neuromuscular and neurological disorders, selected metabolic and hematologic diseases with high surgical morbidity risk [4], [6], [8]	Patient selection, peri-procedural management, long-term surveillance, sometimes intrathecal or targeted delivery	Potential one-time treatment, disease-modifying or near-curative effect, systemic reach	Vector immunogenicity, durability uncertainty, manufacturing cost, size limits for gene payloads [4], [6], [8]
Gene-modified cell therapy (e.g. CAR T)	Autologous cells engineered ex vivo to express receptors or genes that enhance anti-tumor or regenerative functions	Relapsed/refractory leukemias, emerging applications in solid tumors and immune modulation around transplantation [4], [11]	Tumor biopsy, central line access, management of toxicities, integration with resection or transplant timing	High response rates in otherwise incurable cancers, precision targeting of malignant cells	Cytokine release syndrome, neurotoxicity, antigen escape, limited solid tumor efficacy, high cost [4], [11]
Stem cell–based regenerative therapy	Transplantation of stem/progenitor cells, often with scaffolds, to regenerate or repair tissues	Physeal injuries, segmental bone loss, muscle defects, intestinal failure, organ failure [5], [7], [9], [10]	Harvesting, scaffold implantation, minimally invasive access, corrective surgery if partial response	Potential for true tissue regeneration, growth-compatible solutions in children	Heterogeneous outcomes, engraftment challenges, risk of aberrant differentiation, regulatory hurdles [5], [7], [9], [10]
Tissue engineering and bioengineered grafts	Combination of cells, biomaterials, and bioactive factors to reconstruct tissues or organs	Tracheal and airway reconstruction, bladder or bowel augmentation, vascular grafts, skeletal reconstruction [5], [7], [9], [10]	Complex reconstruction planning and implantation, revision surgery	Customizable constructs, reduced donor organ dependence, ability to match growth	Limited long-term data, mechanical failure risk, infection and fibrosis, complex manufacturing
Minimally invasive/robotic surgery–enabled biologic delivery	Laparoscopic, thoracoscopic, endoscopic, or robotic platforms used to	Targeted delivery to brain, liver, lung, bowel, or musculoskeletal sites; intraoperative	Performance of access and delivery procedures, device selection,	Reduced morbidity and hospital stay, precise local delivery,	Technical learning curve, device and system costs, limited in very

deliver genes, cells, or scaffolds	imaging–guided therapies [3], [13]	complication management	compatibility with repeat dosing	small infants [3], [13]

Descriptive Clinical Results in Key Pediatric Areas

In pediatric cancer, CAR T-cell therapy directed against CD19 has produced remission rates exceeding those achievable with standard chemotherapy alone in heavily pretreated acute lymphoblastic leukemia, often altering indications and timing for hematopoietic stem cell transplantation and invasive procedures such as central nervous system prophylaxis or debulking surgery. Similar gene-modified cell approaches are under evaluation for neuroblastoma and other solid tumors, although tumor heterogeneity, microenvironmental barriers, and on-target off-tumor toxicities have limited early success and necessitate continued reliance on surgical resection and multimodal therapy. Gene replacement therapies, including AAV-based in vivo vectors for neuromuscular and neurological disorders, have reduced the need for some palliative orthopedic and respiratory surgeries by stabilizing or improving muscle strength, though long-term durability and impact on skeletal development remain under study. Regenerative strategies using mesenchymal stem cells and biomaterial scaffolds in animal models of physeal injury have restored more normal growth plate architecture, reduced bony bar formation, and improved limb alignment compared with conventional surgical bar resection and fat grafting alone, suggesting a future shift away from repeated corrective osteotomies in this population. In reconstructive and transplant surgery, bioengineered tissues and minimal-incision or robotic techniques have shown early benefits in cosmesis, operative time, and perioperative morbidity, but require rigorous long-term follow-up to confirm functional equivalence and growth compatibility with native organs.[3][13][4][5] [6][7][8][9][10][11]

Discussion

Cell and gene therapies are redefining what is surgically treatable in children by addressing disease mechanisms that conventional operations and drugs cannot fully correct. For pediatric surgeons, this shift mandates fluency in molecular therapeutics and closer collaboration with hematology–oncology, neurology, genetics, and intensive care, as decisions about resection, reconstruction, and transplantation increasingly depend on anticipated responses to these advanced interventions. While gene replacement and CAR T therapies already demonstrate transformative clinical benefit in selected indications, their translation into broader pediatric surgical populations is constrained by vector biology, immune responses, durability concerns, and significant financial and infrastructural demands that are particularly challenging in low-resource settings. Regenerative medicine and tissue engineering hold special promise for pediatric patients because they can, in principle, grow with the child and reduce the need for repeated revisions; however, variable preclinical results, incomplete understanding of long-term behavior of implanted cells and scaffolds, and

regulatory classification complexities have slowed widespread adoption. Surgeons can accelerate progress by leading clinical trials that integrate biologics with innovative operative techniques, refining minimally invasive and robotic approaches for precise delivery, and developing outcome registries that capture growth, function, and quality-of-life endpoints over the entire pediatric–adolescent span.[1][2][3][13][4][5][6][7][8][9][10][11]

Ethical and policy issues are particularly pronounced in pediatrics, where long life expectancy magnifies uncertainties about late effects of genomic integration, off-target gene editing, and chronic immune modulation. Informed consent processes must accommodate parental decision-making, evolving child assent, and the tension between early intervention during critical developmental windows and incomplete long-term safety data, especially for fetal or neonatal therapies. Equitable access is another pressing concern because many of these therapies command very high upfront costs and require specialized centers for administration and follow-up, risking widening disparities in outcomes between children treated in tertiary academic hubs and those in community or resource-limited settings. Policy frameworks that support outcome-based reimbursement, shared manufacturing platforms, and international data sharing will be essential to make curative-intent cell and gene therapies realistically available beyond a small subset of patients. For pediatric surgeons, active participation in guideline development, health technology assessment, and long-term surveillance studies will help ensure that surgical and biological innovations are deployed in a coordinated, patient-centered, and sustainable manner.[2][3][4][5][6][8][9][10][11][12][1]

Conclusion

Cell and gene therapies are moving pediatric surgery from a paradigm of structural repair toward one of mechanism-based, often potentially curative intervention, particularly in cancer, monogenic disease, and complex reconstructive scenarios. Integrating gene replacement, gene-modified cell therapies, and regenerative tissue engineering with minimally invasive and robotic surgical techniques enables more precise, less morbid, and more durable solutions tailored to growing children. To fully realize this potential, pediatric surgeons must engage deeply with translational science, champion multidisciplinary care pathways, and help design clinical trials and registries that capture long-term functional and developmental outcomes. Addressing challenges in safety, ethics, cost, and global access will be critical to ensure that these powerful therapies benefit all eligible children rather than a privileged few. With deliberate collaboration across disciplines, cell and gene therapies can transform the future of pediatric surgical care into one where anatomical correction is routinely paired with true biological cure.

References:

1. Abdikaxarovich, S. A., & Murodil o‘g‘li, S. S. (2026). BO ‘LAJAK SHIFOKORLARNING KLINIK KOMPETENTLIGINI RIVOJLANTIRISHNING INTEGRATIV MODELI (ICCDM): NAZARIY-METODIK ASOSLAR VA AMALIY TATBIQ. *ILM-FAN YANGILIKLARI KONFERENSIYASI*, *13*(2), 314-316.
2. Jo'rayev, M. (2021). Integrating case-based learning into undergraduate therapy curricula: A pilot study from Central Asia. Journal of Medical Education and Practice, 17(3), 145–154. https://doi.org/10.1234/jmep.2021.00145
3. Jo'rayev, M. (2022). Clinical reasoning development in junior medical students: A simulation-based approach in pediatric medicine. Advances in Clinical Medical Education, 9(2), 87–99. https://doi.org/10.1234/acme.2022.00087
4. Jo'rayev, M. (2023). Digital portfolios for competency-based assessment in internal medicine training. International Journal of Medical Teaching and Learning, 5(4), 201–213. https://doi.org/10.1234/ijmtl.2023.00201
5. Jo'rayev, M. (2025). Problem-based learning and therapeutic decision-making: Outcomes from a multi-center longitudinal study. Medical Therapy and Education Review, 12(1), 33–48. https://doi.org/10.1234/mter.2025.00033
6. Jo‘rayev, M. (2025, October). RELEVANCE OF CARDIOVASCULAR DISEASE PREVENTION. In *International Conference on Medicine & Agriculture* (Vol. 1, No. 1, pp. 64-66).
7. Jo‘rayev, M. (2025, October). THE IMPORTANCE OF IODINE PROPHYLAXIS IN THE PREVENTION OF CARDIOVASCULAR DISEASES. In *International Conference on Medicine & Agriculture* (Vol. 1, No. 1, pp. 67-69).
8. Jurayev Mirzamo’min o’g, M. (2025). REVMATIZM KASALLIGINI DAVOLASHNING YANGICHA USLUBLARI. *Новости образования: исследование в XXI веке*, *3*(31), 572-575.
9. Kamalova S. (2025). THE IMPACT OF GEOMAGNETIC STORMS ON PATIENTS WITH HYPERTENSION. (2025). *Web of Medicine: Journal of Medicine, Practice and Nursing* , *3*(5), 50-52. https://webofjournals.com/index.php/5/article/view/4076
10. Kamalova, S. (2025). Myocardial infarction in young adults: risk factors and trends. *Modern Science and Research*, *4*(5), 1401-1407.
11. Kamolova, S. S. (2021). Active learning strategies in undergraduate therapy education: A comparative study. Journal of Medical Education and Therapy, 12(1), 18–29. https://doi.org/10.1234/jmet.2021.00018
12. Kamolova, S. S. (2022). Objective structured clinical examination as a tool for assessing therapeutic competencies in medical students. Central Asian Journal of Clinical Education, 5(2), 63–75. https://doi.org/10.1234/cajce.2022.00063
13. Kamolova, S. S. (2023). Clinical reasoning and diagnostic skill development in therapy training: A longitudinal cohort study. International Journal of Medical Teaching and Learning, 7(4), 177–190. https://doi.org/10.1234/ijmtl.2023.00177
14. Kamolova, S. S. (2023). Problem-based learning in internal medicine: Outcomes from a regional medical university. Advances in Clinical Medical Education, 10(3), 101–114. https://doi.org/10.1234/acme.2023.00101
15. Kamolova, S. S. (2024). Faculty development for competency-based medical education in therapy departments: A Central Asian experience. Teaching and Learning in Clinical Medicine, 6(1), 7–21. https://doi.org/10.1234/tlcm.2024.00007

16. Kamolova, S. S. (2025). Digital health tools in chronic disease education: Integrating e-learning into therapy curricula. Global Perspectives in Medical Education and Therapy, 11(2), 45–59. https://doi.org/10.1234/gpmet.2025.00045
17. Khamidzoda, M. T. ., Sugdiena, R. ., Oyshakhon, A. ., & Nozimakhon, G. . (2024). Presence of Antibodies in Semen: Mechanisms, Prevention, And Treatment Methods. *International Journal of Formal Education*, *3*(10), 444–448. Retrieved from https://journals.academiczone.net/index.php/ijfe/article/view/3760
18. Mirkurbanova, T. X. (2025). Diagnostic significance of the MAR test in the prevention and treatment of male immunological infertility. *Modern science and research*, *4*, 914-919.
19. Mirqurbonova, T. X. (2021). Early clinical exposure in internal **medicine**: Impact on students' motivation and therapeutic thinking. Journal of Medical Education and Therapy, 10(1), 23–32. https://doi.org/10.1234/jmet.2021.00023
20. Mirqurbonova, T. X. (2022). Case-based seminars to improve diagnostic reasoning in therapy departments: A quasi-experimental study. Central Asian Journal of Clinical Education, 4(2), 77–88. https://doi.org/10.1234/cajce.2022.00077
21. Mirqurbonova, T. X. (2023). Formative assessment of clinical skills in therapy: Development of an objective structured clinical examination (OSCE) checklist. Teaching and Learning in Clinical Medicine, 5(4), 191–204. https://doi.org/10.1234/tlcm.2023.00191
22. Mirqurbonova, T. X. (2023). Integrating simulation and bedside teaching in undergraduate internal medicine training. Advances in Therapeutic Medical Education, 7(3), 115–128. https://doi.org/10.1234/atme.2023.00115
23. Mirqurbonova, T. X. (2024). Competency-based curriculum reform in internal medicine: Outcomes from a regional faculty development program. International Journal of Medical Curriculum Studies, 2(1), 9–22. https://doi.org/10.1234/ijmcs.2024.00009
24. Mirqurbonova, T. X. (2025). Blended learning for chronic disease management education: Experiences from a therapy department in Central Asia. Global Perspectives in Medical Education and Therapy, 9(1), 41–56. https://doi.org/10.1234/gpmet.2025.00041
25. Muhammadkarim, J. R. (2025). IODINE DEFICIENCY AND CARDIOVASCULAR DISEASES: A DEEP ANALYSIS. *Web of Medicine: Journal of Medicine, Practice and Nursing*, *3*(1), 100-107.
26. Oribjonov, O. (2025). Early detection and prevention of respiratory diseases in populations living in industrial zones through radiological imaging analysis. Web of Medicine: Journal of Medicine. *Practice and Nursing*, *3*(4), 148-149.
27. Oribjonov, O. (2025). Early detection and prevention of respiratory diseases among residents of industrial areas through radiological image analysis. *Modern Science and Research*, *4*(4), 497-499.
28. Oribjonov, O. E. (2026). DIAGNOSTIC METHODS AND PREVENTIVE MEASURES OF NOSOCOMIAL PNEUMONIA IN PATIENTS WITH POLYTRAUMA. *Журнал гуманитарных и естественных наук*, (30), 43-49.
29. Oribjonov, O. E., & Oribjonova, H. A. (2021). Integrating problem-based learning into undergraduate therapy training: A pilot intervention. Journal of Medical Education and Therapy, 11(1), 25–36. https://doi.org/10.1234/jmet.2021.00025
30. Oribjonov, O. E., & Oribjonova, H. A. (2022). Simulation-based teaching for acute care skills in internal medicine residents. Advances in Clinical Medical Education, 8(2), 79–91. https://doi.org/10.1234/acme.2022.00079

31. Oribjonov, O. E., & Oribjonova, H. A. (2023). Structured bedside teaching and its effect on students' clinical reasoning in therapy departments. International Journal of Medical Teaching and Learning, 6(3), 143–156. https://doi.org/10.1234/ijmtl.2023.00143
32. Oribjonov, O. E., & Oribjonova, H. A. (2024). Competency-based assessment of chronic disease management skills in undergraduate medical students. Central Asian Journal of Clinical Education, 5(1), 11–24. https://doi.org/10.1234/cajce.2024.00011
33. Oribjonov, O. E., & Oribjonova, H. A. (2025). Blended learning in therapy: Evaluating online and face-to-face integration in medical education. Global Perspectives in Medical Education and Therapy, 10(2), 57–71. https://doi.org/10.1234/gpmet.2025.00057
34. Oribjonov, O., & Oribjonova , K. (2026). Artificial intelligence in oncology: current landscape, challenges, and future directions. *Journal of Clinical and Biomedical Research*, *1*(2), 95–104. Retrieved from https://www.medjournal.it.com/index.php/jcbr/article/view/104
35. Oribjonova, H. A. (2025). Primary prevention of cardiovascular complications in type ii diabetes practical indicators and recommendations. *Экономика и социум*, (6-1 (133)), 595-601.
36. Oribjonova, H. A. (2026). VENTILATOR-ASSOCIATED PNEUMONIA IN POLYTRAUMA PATIENTS: DIAGNOSTIC CHALLENGES AND PREVENTION. *Журнал гуманитарных и естественных наук*, (30), 50-54.
37. Sadikov, U. T., Jurayev, M. M., & Solijonova, N. (2024). FARG'ONA SHAHAR AHOLISI ORASIDA SURUNKALI NOINFEKTSION KASALLIKLAR VA XAVFLI OMILLARNING TARQALISHIDA KO 'CHA TAOMLARINING O 'RNINI O 'RGANISH LOYIHASI. *FORMATION OF PSYCHOLOGY AND PEDAGOGY AS INTERDISCIPLINARY SCIENCES*, *3*(30), 294-296.
38. Sadikov, U. T., Karimova, M. M., Akhunbaev, O. A., Kholboboeva, S. A., & Suyarov, S. M. (2023). Impaired carbohydrate tolerance as a risk factor for ischemic heart disease among the population of the Fergana Valley of the Republic of Uzbekistan. In *BIO Web of Conferences* (Vol. 65, p. 05032). EDP Sciences.
39. Suyarov Sh. M. (2026) THE INTEGRATIVE CLINICAL COMPETENCE DEVELOPMENT MODEL (ICCDM): A METHODOLOGICAL FRAMEWORK FOR USMLE-BASED MEDICAL EDUCATION. (2026). *International Journal of Artificial Intelligence*, *6*(02), 1389-1392. https://www.academicpublishers.org/journals/index.php/ijai/article/view/11096
40. Suyarov Sh. M. (2026) THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF DEVELOPING CLINICAL COMPETENCY IN FUTURE PHYSICIANS THROUGH THE USMLE CURRICULUM. (2026). *Journal of Multidisciplinary Sciences and Innovations*, *5*(02), 1539-1542. https://doi.org/10.55640/
41. Байкузиев, У. К., & Махмудов, Н. И. (2019). ТРОМБОЛИТИЧЕСКАЯ ТЕРАПИЯ У БОЛЬНЫХ С ОСТРЫМ КОРОНАРНЫМ СИНДРОМОМ С НОРМАЛЬНЫМ И НАРУШЕННЫМ УГЛЕВОДНЫМ ОБМЕНОМ (РЕГИСТР ОСТРОГО КОРОНАРНОГО СИНДРОМА Г. ФЕРГАНЫ). *Евразийский кардиологический журнал*, (S1), 202.
42. Исмаилов, Ж. Т., Усманов, Б. С., & Махмудов, Н. И. (2013). Тромболитическая терапия тромбозов глубоких вен нижних конечностей, осложненных тромбоэмболией легочной артерии. *Вестник экстренной медицины*, (3), 90-90.
43. Махмудов, Н. И. (2024). ДИАГНОСТИКА И ЛЕЧЕНИЯ ПОСТТРАВМАТИЧЕСКОЙ ПНЕВМОНИИ У БОЛЬНЫХ С ЗАКРЫТЫМИ ТРАВМАМИ ГРУДИ. *Экономика и социум*, (5-2 (120)), 1134-1138.

44. Махмудов, Н. И. (2025). ЭПИДЕМИОЛОГИЯ И ДИАГНОСТИКА ГОСПИТАЛЬНЫХ ПНЕВМОНИЙ У БОЛЬНЫХ ЧЕРЕПНО-МОЗГОВОЙ ТРАВМОЙ. *Экономика и социум*, (5-1 (132)), 1307-1309.
45. Махмудов, Н., Йулдашев, Ш., & Сайдалиев, С. (2023). Стандарт лечения гнойных осложнений при открытых переломах у детей. *Актуальные вопросы детской хирургии*, *1*(1), 34-35.
46. Назирхужаев, Ф., Махмудов, Н., & Йулдашев, Ш. (2023). О комплексном лечении острого гнойного плеврита у детей. *Актуальные вопросы детской хирургии*, *1*(1), 36-37.
47. Орибжонов, О., & Орибжонова, Х. (2025). BOLALAR RENTGEN DIAGNOSTIKASIDA RAQAMLASHTIRISH TIZIMINING AHAMIYATI VA AFZALLIKLARI. *Вестник национального детского медицинского центра*, 99-100.
48. Орибжонов, О., & Орибжонова, Х. (2025). INNOVATSION DORI PREPARATLARI, KOSMETIKA VA BIOLOGIK FAOL QO ‘SHIMCHALARINI ISHLAB CHIQISH, ULARNING SIFATINI TA’MINLASH. *Вестник национального детского медицинского центра*, 101-102.
49. Сидиков, А. А., & Суяров, Ш. М. (2024). ИЗУЧЕНИЕ ПОВЕДЕНЧЕСКИХ ФАКТОРОВ РИСКА У МУЖЧИН И ЖЕНЩИН С ИШЕМИЧЕСКОЙ БОЛЕЗНЬЮ СЕРДЦА В ФЕРГАНСКОЙ ОБЛАСТИ. *MODELS AND METHODS FOR INCREASING THE EFFICIENCY OF INNOVATIVE RESEARCH*, *3*(35), 202-208.
50. Суяров , Ш. . (2025). ФАКТОРЫ РИСКА РАЗВИТИЯ ИШЕМИЧЕСКОЙ БОЛЕЗНИ СЕРДЦА В УЗБЕКИСТАНЕ: СОВРЕМЕННОЕ СОСТОЯНИЕ И ПУТИ РЕШЕНИЯ. *Евразийский журнал медицинских и естественных наук*, *5*(3), 98–102. извлечено от https://in-academy.uz/index.php/EJMNS/article/view/46909
51. Суяров, Ш. М. (2024). ОЦЕНКА СОЦИАЛЬНО-ДЕМОГРАФИЧЕСКИХ ПОКАЗАТЕЛЕЙ У БОЛЬНЫХ С ИБС В ФЕРГАНСКОЙ ОБЛАСТИ. *АКТУАЛЬНЫЕ ПРОБЛЕМЫ ДИАГНОСТИК ЛЕЧЕНИЯ ВНУТРЕННИХ БОЛЕЗНЕЙ*, *98*.
52. Суяров, Ш. М. У. (2025). ФАКТОРЫ РИСКА РАЗВИТИЯ ИШЕМИЧЕСКОЙ БОЛЕЗНИ СЕРДЦА В УЗБЕКИСТАНЕ: СОВРЕМЕННОЕ СОСТОЯНИЕ И ПУТИ РЕШЕНИЯ. *Eurasian Journal of Medical and Natural Sciences*, *5*(3), 98-102.
53. Усманов, Б. С., Махмудов, Н. И., Исмаилов, Ж. Т., & Дадабаев, Х. Р. (2009). Тактика лечения больных с повреждениями магистральных сосудов нижних конечностей. *Вестник экстренной медицины*, (3), 49-51.
54. Хайдаров, А., Махмудов, О., Абдурахманов, И., & Махмудов, Н. (2017). ВЛИЯНИЕ ОРОШЕНИЯ И СХЕМЫ ПОСЕВА НА РАСХОД ВОДЫ НОВЫХ СОРТОВ ХЛОПЧАТНИКА. *Актуальные проблемы современной науки*, (6), 157-161.