

CRR
JOURNAL
OF CARDIORESPIRATORY RESEARCH

ISSN 2181-0974
DOI 10.26739/2181-0974
Impact Factor SJIF 2022: 5.937

Journal of

**CARDIORESPIRATORY
RESEARCH**



Volume 7, Issue 2/1

2026

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ
РЕСПУБЛИКИ УЗБЕКИСТАН

Журнал кардиореспираторных исследований

JOURNAL OF CARDIORESPIRATORY RESEARCH

Главный редактор: Э.Н.ТАШКЕНБАЕВА

Учредитель:

Самаркандский государственный
медицинский университет

Tadqiqot.uz

Ежеквартальный
научно–практический
журнал

ISSN: 2181-0974
DOI: 10.26739/2181-0974



№ 2/1
2026

Главный редактор:

Ташкенбаева Элеонора Негматовна

доктор медицинских наук, профессор, заведующая кафедрой внутренних болезней и кардиологии №2 Самаркандского Государственного медицинского университета, председатель Ассоциации терапевтов Самаркандской области.
<https://orcid.org/0000-0001-5705-4972>

Заместитель главного редактора:

Хайбулина Зарина Руслановна

*доктор медицинских наук, руководитель отдела биохимии с группой микробиологии
ГУ «РСНПМЦХ им. акад. В. Вахидова» <https://orcid.org/0000-0002-9942-2910>*

ЧЛЕНЫ РЕДАКЦИОННОЙ КОЛЛЕГИИ:

Аляви Анис Лютфуллаевич

академик АН РУз, доктор медицинских наук, профессор, Председатель Ассоциации Терапевтов Узбекистана, Советник директора Республиканского специализированного научно-практического центра терапии и медицинской реабилитации (Ташкент)
<https://orcid.org/0000-0002-0933-4993>

Бокерия Лео Антонович

академик РАН, доктор медицинских наук, профессор, Президент научного центра сердечно-сосудистой хирургии им. А.Н. Бакулева (Москва), <https://orcid.org/0000-0002-6180-2619>

Курбанов Равшанбек Давлетович

академик АН РУз, доктор медицинских наук, профессор, Советник директора Республиканского специализированного научно-практического медицинского центра кардиологии (Ташкент), <https://orcid.org/0000-0001-7309-2071>

Шкляев Алексей Евгеньевич

д.м.н., профессор, ректор Федерального государственного бюджетного образовательного учреждения высшего образования «Ижевская государственная медицинская академия» Министерства здравоохранения Российской Федерации

Michał Tendera

профессор кафедры кардиологии Верхнесилезского кардиологического центра, Силезский медицинский университет в Катовице, Польша (Польша)
<https://orcid.org/0000-0002-0812-6113>

Покушалов Евгений Анатольевич

доктор медицинских наук, профессор, заместитель генерального директора по науке и развитию сети клиник «Центр новых медицинских технологий» (ЦНМТ), (Новосибирск), <https://orcid.org/0000-0002-2560-5167>

Зуфаров Миржамол Мирумарович

доктор медицинских наук, профессор, руководитель отдела ГУ «РСНПМЦХ им. акад. В. Вахидова» <https://orcid.org/0000-0003-4822-3193>

Акилов Хабибулла Атауллаевич

доктор медицинских наук, профессор, Директор Центра развития профессиональной квалификации медицинских работников (Ташкент)

Насирова Зарина Акбаровна

DSc, доцент кафедры внутренних болезней и кардиологии №2 Самаркандского Государственного Медицинского университета (ответственный секретарь) ORCID: 0000-0002-8722-0393 (ответственный секретарь)

Ризаев Жасур Алимджанович

доктор медицинских наук, профессор, Ректор Самаркандского государственного медицинского университета, <https://orcid.org/0000-0001-5468-9403>

Зиядуллаев Шухрат Худойбердиевич

доктор медицинских наук, профессор, первый заместитель директора по академической деятельности Самаркандского филиала Международного Университета Кимё в Ташкенте
<https://orcid.org/0000-0002-9309-3933>

Джан Ковак

Профессор, председатель Совета Европейского общества кардиологов по инсульту, руководитель специализированной кардиологии, заведующий отделением кардиологии, кардио- и торакальной хирургии, консультант-кардиолог, больница Гленфилд, Лестер (Великобритания)

Сергио Бернардини

Профессор клинической биохимии и клинической молекулярной биологии, главный врач отдела лабораторной медицины, больница Университета Тор Вергата (Рим, Италия)

Ливерко Ирина Владимировна

доктор медицинских наук, профессор, заместитель директора по науке Республиканского специализированного научно-практического медицинского центра фтизиатрии и пульмонологии Республики Узбекистан (Ташкент)
<https://orcid.org/0000-0003-0059-9183>

Цурко Владимир Викторович

доктор медицинских наук, профессор Первого Московского государственного медицинского университета им. И.М. Сеченова (Москва)
<https://orcid.org/0000-0001-8040-3704>

Тригулова Ранса Хусановна

Доктор медицинских наук, руководитель лаборатории превентивной кардиологии, ведущий научный сотрудник лаборатории ИБС и атеросклероза. Республиканский специализированный научно-практический медицинский центр кардиологии (Ташкент)
ORCID- 0000-0003-4339-0670

Тураев Феруз Фатхуллаевич

доктор медицинских наук, Директор Республиканского специализированного научно-практического медицинского центра эндокринологии имени академика Ю.Г. Туракулова

Bosh muharrir:

Tashkenbayeva Eleonora Negmatovna

tibbiyot fanlari doktori, professor, Samarqand davlat tibbiyot universiteti 2-sonli ichki kasalliklar va kardiologiya kafedrasini mudiri, Samarqand viloyati vrachlar uyushmasi raisi
<https://orsid.org/0000-0001-5705-4972>

Bosh muharrir o'rinbosari:

Xaibulina Zarina Ruslanovna

tibbiyot fanlari doktori, "akad V. Vohidov nomidagi RIJM davlat institutining mikrobiologiya guruhi bilan biokimyo kafedrasini mudiri" <https://orcid.org/0000-0002-9942-2910>

TAHRIRIYAT A'ZOLARI:

Alyavi Anis Lyutfullayevich

O'zbekiston Respublikasi Fanlar akademiyasining akademigi, tibbiyot fanlari doktori, professor, O'zbekiston Terapevtlar uyushmasi raisi, Respublika ixtisoslashtirilgan ilmiy va amaliy tibbiy terapiya markazi va tibbiy reabilitatsiya direktori maslahatchisi (Toshkent), <https://orcid.org/0000-0002-0933-4993>

Bockeria Leo Antonovich

Rossiya fanlar akademiyasining akademigi, tibbiyot fanlari doktori, professor, A.N. Bakuleva nomidagi yurak-qon tomir jarrohligi ilmiy markazi prezidenti (Moskva)
<https://orcid.org/0000-0002-6180-2619>

Kurbanov Ravshanbek Davlatovich

O'zbekiston Respublikasi Fanlar akademiyasining akademigi, tibbiyot fanlari doktori, professor, Respublika ixtisoslashtirilgan kardiologiya ilmiy-amaliy tibbiyot markazining direktor maslahatchisi (Toshkent)
<https://orcid.org/0000-0001-7309-2071>

Shklyayev Aleksey Evgenievich

Tibbiyot fanlari doktori, professor, Rossiya Federatsiyasi Sog'liqni saqlash vazirligining "Izhevsk davlat tibbiyot akademiyasi" Federal davlat byudjeti oliy ta'lim muassasasi rektori

Mixal Tendera

Katovitsadagi Sileziya Tibbiyot Universiteti, Yuqori Sileziya Kardiologiya Markazi kardiologiya kafedrasini professori (Polsha)
<https://orcid.org/0000-0002-0812-6113>

Pokushalov Evgeniy Anatolevich

tibbiyot fanlari doktori, professor, "Yangi tibbiy texnologiyalar markazi" (YTTM) klinik tarmog'ining ilmiy ishlar va rivojlanish bo'yicha bosh direktorining o'rinbosari (Novosibirsk) <https://orcid.org/0000-0002-2560-5167>

Zufarov Mirjamol Mirumarovich

tibbiyot fanlari doktori, professor, "akad V. Vohidov nomidagi RIJM davlat muassasasi" bo'limi boshlig'i"
<https://orcid.org/0000-0003-4822-3193>

Akilov Xabibulla Ataulayevich

tibbiyot fanlari doktori, professor, Tibbiyot xodimlarining kasbiy malakasini oshirish markazi direktori (Toshkent)

Nasirova Zarina Akbarovna

Samarqand davlat tibbiyot universiteti 2-sonli ichki kasalliklar va kardiologiya kafedrasini dotsenti, DSc (mas'ul kotib) ORCID: 0000-0002-8722-0393 (*mas'ul kotib*)

Rizayev Jasur Alimjanovich

tibbiyot fanlari doktori, professor, Samarqand davlat tibbiyot universiteti rektori
<https://orcid.org/0000-0001-5468-9403>

Ziyadullayev Shuxrat Xudoyberdiyevich

tibbiyot fanlari doktori, professor, Toshkent shahridagi Kimyo xalqaro universitetining Samarqand filiali direktorining akademik faoliyat bo'yicha birinchi o'rinbosari (Toshkent)
<https://orcid.org/0000-0002-9309-3933>

Jan Kovak

Yevropa kardiologiya jamiyati insult kengashi raisi, 2017 yildan buyon ixtisoslashtirilgan kardiologiya kafedrasini rahbari, kardiologiya, yurak va torakal jarrohlik kafedrasini mudiri, maslahatchi kardiolog Glenfild kasalxonasi, Lester (Buyuk Britaniya)

Sergio Bernardini

Klinik biokimyo va klinik molekulyar biologiya bo'yicha professor - Laboratoriya tibbiyoti bo'limi bosh shifokori – Tor Vergata universiteti kasalxonasi (Rim-Italiya)

Liverko Irina Vladimirovna

tibbiyot fanlari doktori, professor, Respublika ixtisoslashtirilgan fiziologiya va pulmonologiya ilmiy-amaliy tibbiyot markazining ilmiy ishlar bo'yicha direktor o'rinbosari (Toshkent)
<https://orcid.org/0000-0003-0059-9183>

Surko Vladimir Viktorovich

tibbiyot fanlari doktori, professori I.M. Sechenov nomidagi Birinchi Moskva Davlat tibbiyot universiteti (Moskva)
<https://orcid.org/0000-0001-8040-3704>

Trigulova Raisa Xusainovna

Tibbiyot fanlari doktori, Profilaktik kardiologiya laboratoriyasi mudiri, YuIK va ateroskleroz laboratoriyasining yetakchi ilmiy xodimi. Respublika ixtisoslashtirilgan kardiologiya ilmiy-amaliy tibbiyot markazi (Toshkent)
ORCID- 0000-0003-4339-0670

Turayev Feruz Fatxullayevich

tibbiyot fanlari doktori, akademik Y.X.To'raqulov nomidagi Respublika ixtisoslashtirilgan endokrinologiya ilmiy amaliy tibbiyot markazi direktori
<https://orcid.org/0000-0002-1321-4732>

Chief Editor:

Tashkenbaeva Eleonora Negmatovna

Doctor of Medical Sciences, professor, Head of the Department of Internal Diseases and cardiology No. 2 of the Samarkand State Medical University, Chairman of the Association of Physicians of the Samarkand Region. <https://orsid.org/0000-0001-5705-4972>

Deputy Chief Editor:

Xaibulina Zarina Ruslanovna

Doctor of Medical Sciences, Head of the Department of Biochemistry with the Microbiology Group of the State Institution "RSSC named after acad. V. Vakhidov", <https://orcid.org/0000-0002-9942-2910>

MEMBERS OF THE EDITORIAL BOARD:

Alyavi Anis Lutfullaevich

Academician of the Academy of Sciences of the Republic of Uzbekistan, Doctor of Medical Sciences, Professor, Chairman of the Association of Physicians of Uzbekistan, Advisor to the Director of the Republican Specialized Scientific - Practical Center of Therapy and Medical Rehabilitation (Tashkent) <https://orcid.org/0000-0002-0933-4993>

Bockeria Leo Antonovich

Academician of the Russian Academy of Sciences, Doctor of Medical Sciences, Professor, President of the Scientific Center for Cardiovascular Surgery named after A.N. Bakuleva (Moscow) <https://orcid.org/0000-0002-6180-2619>

Kurbanov Ravshanbek Davletovich

Academician of the Academy of Sciences of the Republic of Uzbekistan, Doctor of Medical Sciences, Professor, Advisor to the Director Republican Specialized Scientific and Practical Medical Center of Cardiology, (Tashkent) <https://orcid.org/0000-0001-7309-2071>

Shklyayev Aleksey Evgenievich

Doctor of Medical Sciences, Professor, Rector of the Federal State Budgetary Educational Institution of Higher Education "Izhevsk State Medical Academy" of the Ministry of Health of the Russian Federation

Michal Tendera

Professor of the Department of Cardiology, Upper Silesian Cardiology Center, Silesian Medical University in Katowice, Poland (Poland) <https://orcid.org/0000-0002-0812-6113>

Pokushalov Evgeny Anatolyevich

Doctor of Medical Sciences, Professor, Deputy Director General for Science and Development of the Clinic Network "Center for New Medical Technologies" (CNMT), (Novosibirsk) <https://orcid.org/0000-0002-2560-5167>

Akilov Xabibulla Ataulaevich

Doctor of Medical Sciences, Professor, Center for the development of professional qualifications of medical workers (Tashkent)

Nasyrova Zarina Akbarovna

DSc, Associate Professor of the Department of Internal Diseases and cardiology No. 2 of the Samarkand State Medical University (Executive Secretary) ORCID: 0000-0002-8722-0393 (Executive Secretary)

Rizaev Jasur Alimjanovich

Doctor of Medical Sciences, Professor, Rector of the Samarkand State Medical University <https://orcid.org/0000-0001-5468-9403>

Ziyadullaev Shuhrat Khudoyberdievich

Doctor of Medical Sciences, Professor, Deputy Director for Scientific Doctor of Medical Sciences, Professor, First Deputy Director for Academic Affairs of the Samarkand branch of Kimyo International University in Tashkent <https://orcid.org/0000-0002-9309-3933>

Jan Kovac

Professor Chairman, European Society of Cardiology Council for Stroke, Lead of Specialised Cardiology, Head of Cardiology, Cardiac and Thoracic Surgery, Consultant Cardiologist, Glenfield Hospital, Leicester (United Kingdom)

Sergio Bernardini

Full Professor in Clinical Biochemistry and Clinical Molecular Biology -Head Physician of the Laboratory Medicine Unit- University of Tor Vergata Hospital (Rome-Italy)

Liverko Irina Vladimirovna

Doctor of Medical Sciences, Professor, Deputy Director for Science of the Republican Specialized Scientific and Practical Medical Center for Phthiology and Pulmonology of the Republic of Uzbekistan (Tashkent) <https://orcid.org/0000-0003-0059-9183>

Zufarov Mirjamol Mirumarovich

Doctor of Medical Sciences, Professor, Head of the Department of the State Institution "RSNPMTSH named after acad. V. Vakhidov" <https://orcid.org/0000-0003-4822-3193>

Tsurko Vladimir Viktorovich

Doctor of Medical Sciences, professor Of Moscow State Medical University by name I.M. Sechenov (Moscow) <https://orcid.org/0000-0001-8040-3704>

Trigulova Raisa Khusainovna

Doctor of Medical Sciences, Head of the Laboratory of Preventive Cardiology, Leading Researcher of the Laboratory of IHD and Atherosclerosis. Republican Specialized Scientific and Practical Medical Center of Cardiology (Tashkent) ORCID- 0000-0003-4339-0670

Turaev Feruz Fatxullaevich

Doctor of Medical Sciences, Director of the Republican Specialized Scientific and Practical Medical Center of Endocrinology named after Academician Yu.G. Turakulova

Алимов Дониёр Анварович
доктор медицинских наук, директор
Республиканского научного центра
экстренной медицинской помощи

Абдуллаев Акбар Хатамович
доктор медицинских наук, главный
научный сотрудник Республиканского
специализированного научно-
практического центра медицинской
терапии и реабилитации
<https://orcid.org/0000-0002-1766-4458>

Агабабян Ирина Рубеновна
кандидат медицинских наук, доцент,
заведующая кафедрой терапии ФПДО,
Самаркандского Государственного
медицинского института

Алиева Нигора Рустамовна
доктор медицинских наук, заведующая
кафедрой Госпитальной педиатрии №1
с основами нетрадиционной медицины
ТашПМИ

Исмаилова Адолат Абдурахимовна
доктор медицинских наук, профессор,
заведующая лабораторией
фундаментальной иммунологии
Института иммунологии геномики
человека АН РУз

Камалов Зайнитдин Сайфутдинович
доктор медицинских наук, профессор,
заведующий лабораторией
иммунорегуляции Института
иммунологии и геномики
человека АН РУз

Каюмов Улугбек Каримович
доктор медицинских наук, профессор,
заведующий кафедрой внутренних
болезней и телемедицины Центра
развития профессиональной
квалификации медицинских работников

Хусинова Шоира Акбаровна
кандидат философских наук, доцент,
заведующая кафедрой общей практики,
семейной медицины ФПДО
Самаркандского Государственного
медицинского института

Шодиколова Гуландом Зикрияевна
д.м.н., профессор, заведующая
кафедрой внутренних болезней № 3
Самаркандского Государственного
Медицинского Института
(Самарканд)
<https://orcid.org/0000-0003-2679-1296>

Doniyorova Farangisbonu Alisher qizi
Toshkent Davlat tibbiyot universiteti
nevrologiya va xalq tabobati kafedrasini
dotsenti, DSc.
<https://orcid.org/0009-0004-4140-4797>

Alimov Doniyor Anvarovich
tibbiyot fanlari doktori, Respublika
shoshilinch tibbiy yordam ilmiy markazi
direktori (Toshkent)

Abdullayev Akbar Xatamovich
tibbiyot fanlari doktori, O'zbekiston
Respublikasi Sog'liqni saqlash
vazirligining "Respublika
ixtisoslashtirilgan terapiya va tibbiy
reabilitatsiya ilmiy-amaliy
tibbiyot markazi" davlat
muassasasi bosh ilmiy xodimi
<https://orcid.org/0000-0002-1766-4458>

Agababyan Irina Rubenovna
tibbiyot fanlari nomzodi, dotsent, DKTF,
terapiya kafedrasini mudiri, Samarqand
davlat tibbiyot instituti

Alieva Nigora Rustamovna
tibbiyot fanlari doktori, 1-sonli gospital
pediatriya kafedrasini mudiri, ToshPTI

Ismoilova Adolat Abduraximovna
tibbiyot fanlari doktori, professor,
O'zbekiston Respublikasi Fanlar
akademiyasining Odam genomikasi
immunologiyasi institutining fundamental
immunologiya laboratoriyasining mudiri

Kamalov Zaynitdin Sayfutdinovich
tibbiyot fanlari doktori, professor,
O'zbekiston Respublikasi Fanlar
akademiyasining Immunologiya va inson
genomikasi institutining Immunogenetika
laboratoriyasi mudiri

Qayumov Ulug'bek Karimovich
tibbiyot fanlari doktori, professor,
Tibbiyot xodimlarining kasbiy malakasini
oshirish markazi, ichki kasalliklar va
teletibbiyot kafedrasini mudiri (Toshkent)

Xusinova Shoira Akbarovna
tibbiyot fanlari nomzodi, dotsent,
Samarqand davlat tibbiyot instituti DKTF
Umumiy amaliyot va oilaviy tibbiyot
kafedrasini mudiri (Samarqand)

Shodiqulova Gulandom Zikriyevna
tibbiyot fanlari doktori, professor,
Samarqand davlat tibbiyot instituti 3-
ichki kasalliklar kafedrasini mudiri
(Samarqand)
<https://orcid.org/0000-0003-2679-1296>

Doniyorova Farangisbonu Alisher qizi
dozent kafedrasini nevrologiya va
narodniy tibbiyot kafedrasini Toshkent
gосударственного медицинского
университета, доктор медицинских
наук. <https://orcid.org/0009-0004-4140-4797>

Alimov Doniyor Anvarovich
Doctor of Medical Sciences, Director of
the Republican Scientific Center of
Emergency Medical Care

Abdullaev Akbar Xatamovich
Doctor of Medical Sciences,
Chief Researcher of the State Institution
"Republican Specialized Scientific and
Practical Medical Center for Therapy and
Medical Rehabilitation" of the Ministry of
Health of the Republic of Uzbekistan,
<https://orcid.org/0000-0002-1766-4458>

Agababyan Irina Rubenovna
PhD, Associate Professor, Head of the
Department of Therapy, FAGE,
Samarqand State Medical Institute

Alieva Nigora Rustamovna
Doctor of Medical Sciences, Head of the
Department of Hospital Pediatrics
No. 1 with the basics of alternative
medicine, TashPMI

Ismailova Adolat Abduraximovna
doctor of Medical Sciences, Professor,
Head of the Laboratory of Fundamental
Immunology of the Institute of
Immunology of Human
Genomics of the Academy of Sciences
of the Republic of Uzbekistan

Kamalov Zaynitdin Sayfutdinovich
doctor of Medical Sciences, Professor,
Head of the Laboratory of
Immunogenetics of the Institute of
Immunology and Human Genomics
of the Academy of Sciences of the
Republic of Uzbekistan

Kayumov Ulugbek Karimovich
Doctor of Medical Sciences, Professor,
Head of the Department of Internal
Diseases and Telemedicine of the Center
for the development of professional
qualifications
of medical workers

Khusinova Shoira Akbarovna
PhD, Associate Professor, Head of the
Department of General Practice,
Family Medicine FAGE of the
Samarqand State Medical Institute

Shodikulova Gulandom Zikriyevna
Doctor of Medical Sciences, professor,
head of the Department of Internal
Diseases N 3 of Samarqand state medical
institute (Samarqand)
<https://orcid.org/0000-0003-2679-1296>

Doniyorova Farangisbonu Alisher qizi
Associate Professor, Department of
Neurology and Traditional Medicine,
Tashkent State Medical University, DSc.
<https://orcid.org/0009-0004-4140-4797>

Халиков Каххор Мирзаевич
кандидат медицинских наук, доцент
заведующий кафедрой биологической
химии Самаркандского
государственного медицинского
университета

Тулабаева Гавхар Миракбаровна
Заведующая кафедрой кардиологии,
Центр развития профессиональной
квалификации медицинских
работников, д.м.н., профессор

**Абдумаджидов Хамидулла
Амануллаевич**
Бухарский государственный
медицинский институт имени Абу
Али ибн Сино. Кафедра «Хирургические
болезни и реанимация». Доктор
медицинских наук, профессор.

Саидов Максуд Арифович
к.м.н., директор Самаркандского
областного отделения
Республиканского специализированного
научно-практического медицинского
центра кардиологии (г. Самарканд)

Срождинова Нигора Зайнутдиновна
д.м.н. Заведующая научно-
исследовательской лабораторией
кардиодиабета и метаболических
нарушений РСНПМЦК

Носирова Дилангиз Акбаровна
Ассистент кафедры внутренних
болезней и кардиологии №2
Самаркандского государственного
медицинского университета
(технический секретарь)

Эсанкулов Мухаммад Олимович
Ассистент кафедры внутренних
болезней и кардиологии №2
Самаркандского государственного
медицинского университета
(технический секретарь)

Xalikov Qaxxor Mirzayevich
Tibbiyot fanlari nomzodi, dotsent
Samarqand davlat tibbiyot universiteti
Biologik kimyo kafedrasini mudiri

Tulabayeva Gavxar Mirakbarovna
kardiologiya kafedrasini mudiri, tibbiyot
xodimlarining kasbiy malakasini rivojlantirish
markazi, tibbiyot fanlari doktori, professor

Abdumadjidov Xamidulla Amanullayevich
«Abu Ali ibn Sino nomidagi Buxoro davlat
tibbiyot oliygohi» Xirurgiya kasalliklari va
reanimatsiya kafedrasini professori, tibbiyot
fanlari doktori.

Saidov Maqsud Arifovich
tibbiyot fanlari nomzodi,
Respublika ixtisoslashgan kardiologiya
ilmiy amaliy tibbiyot markazi Samarqand
viloyat mintaqaviy filiali direktori
(Samarqand)

Srojidinova Nigora Zaynutdinovna
t.f.d. Kardiodiabet va metabolik buzilishlar
ilmiy tadqiqot laboratoriyasi mudiri

Nosirova Dilangiz Akbarovna
Samarqand davlat tibbiyot universiteti 2-son
ichki kasalliklar va kardiologiya kafedrasini
assistenti (texnik kotib)

Esankulov Muxammad Olimovich
Samarqand davlat tibbiyot universiteti 2-son
ichki kasalliklar va kardiologiya kafedrasini
assistenti (texnik kotib), PhD

Khalikov Kakhor Mirzayevich
Candidate of Medical Sciences,
Associate Professor, Head of the Department
of Biological Chemistry, Samarkand State
Medical University

Tulabayeva Gavkhar Mirakbarovna
Head of the Department of Cardiology,
Development Center professional
qualification of medical workers,
MD, professor

**Abdumadjidov Khamidulla
Amanullayevich**
“Bukhara state medical institute named
after Abu Ali ibn Sino”. DSc, professor.

Saidov Maksud Arifovich
Candidate of Medical Sciences, Director
of the Samarkand Regional Department of
the Republican Specialized Scientific and
Practical Medical Center of Cardiology
(Samarkand)

Srojidinova Nigora Zaynutdinovna
DSc, Head of Kardiodiabetes and Metabolic
Disorders Laboratory

Dilangiz Akbarovna Nosirova,
Assistant of the Department of Internal
Diseases and Cardiology No. 2, Samarkand
State Medical University (Technical Secretary)

Esankulov Muhammad Olimovich,
Assistant of the Department of Internal
Diseases and Cardiology No. 2, Samarkand
State Medical University (Technical Secretary)

МЕЖДИСЦИПЛИНАРНЫЕ ПОДХОДЫ В КАРДИОЛОГИИ

1.	<p>М.Д. Абдуллоева, Д.О. Расулова Оценка эффективности миокардиальной реваскуляризации на основе клинико-инструментальных данных у больных ишемической болезнью сердца M.D. Abdullaeva, D.O. Rasulova Assessment of myocardial revascularization effectiveness in patients with ischemic heart disease based on clinical and instrumental data M.D. Abdulloeva, D.O. Rasulova Yurak ishemik kasalligi bilan og'rigan bemorlarda klinik-asbobiy ma'lumotlar asosida miokard revaskulyarizatsiyasi samaradorligini baholash.....</p>	11
2.	<p>З.А. Абдуллаева, С.Т. Джумаева Роль искусственного интеллекта в прогнозировании факторов риска синдрома Дауна: систематический обзор и анализ современных данных Z.A. Abdullayeva, S.T. Djumayeva The role of artificial intelligence in predicting risk factors for Down syndrome: a systematic review and analysis of current evidence Z.A. Abdullayeva, S.T. Djumayeva Daun sindromi uchun xavf omillarini bashorat qilishda sun'iy intellektning roli: mavjud dalillarni tizimli ko'rib chiqish va tahlil qilish.....</p>	17
3.	<p>И.Р. Агабабян, Ю.А. Исмоилова Новые возможности немедикаментозной терапии неалкогольной жировой болезни печени I.R. Agababayan, Y.A. Ismoilova New possibilities of non-drug therapy of non-alcoholic fatty liver disease I.R. Agababayan, Y.A. Ismoilova Jigar noalkogol yog' kasalligini dori-darmonsiz davolashning yangi imkoniyatlari.....</p>	20
4.	<p>Ш.А. Амирова Особенности фибрилляции предсердий у пациентов с ишемической болезнью сердца в сочетании с патологией щитовидной железы Sh.A. Amirova Features of atrial fibrillation in patients with ischemic heart disease combined with thyroid pathology Sh.A. Amirova Qalqonsimon bez patologiyasi bilan birga kechuvchi yurak ishemik kasalligida bo'lmachalar fibrillyatsiya xususiyatlari</p>	24
5.	<p>Н.А. Бобоева, Ж.А. Ризаев Алгоритмы эхокардиографической оценки для персонализации программ медицинской реабилитации после инфаркта миокарда N.A. Boboeva, J.A. Rizaev Echocardiographic assessment algorithms for personalization of cardiac rehabilitation programs after myocardial infarction N.A. Boboyeva, J.A. Rizayev Miokard infarktidan keyin tibbiy reabilitatsiya dasturlarini shaxsiylashtirish uchun exokardiografik baholash algoritmlari</p>	30
6.	<p>Б.З. Джалалов, Э.Н. Ташкенбаева Клинико-биохимическая характеристика маркеров повреждения миокарда у пациентов с инфарктом миокарда в условиях аридного климата B.Z. Jalalov, E.N. Tashkenbaeva Clinical and biochemical characteristics of myocardial injury markers in patients with myocardial infarction under arid climate conditions B.Z. Jalalov, E.N. Tashkenbayeva Quruq iqlim sharoitida miokard infarkti bilan og'rigan bemorlarda miokard shikastlanishi biomarkerlarining klinik-biokimyoviy xususiyatlari.....</p>	36
7.	<p>Н.О. Исмати, З.А. Насырова Комплексная клинико-инструментальная оценка эффективности реваскуляризации миокарда у больных ишемической болезнью сердца N.O. Ismati, Z.A. Nasyrova Comprehensive clinical and instrumental assessment of myocardial revascularization efficiency in patients with ischemic heart disease N.O. Ismati, Z.A. Nasirova Ishemik yurak kasalligiga chalingan bemorlarda miokard revaskulyarizatsiyasining samaradorligini kompleks klinik-instrumental baholash.....</p>	41
8.	<p>Д.Ж. Камолова Гипертензивные состояния при беременности: клинические особенности и материнско перинатальные исходы D.J.Kamolova Hypertensive Disorders in Pregnancy: Clinical Features and Maternal perinatal outcomes D.J.Kamolova Homiladorlikdagi gipertenziv buzilishlar: klinik belgilari va ona perinatal natijalar.....</p>	46

9.	<p>Г.Х. Карабаева, А.Е. Холбаев Оценка кардиоваскулярного риска при хронической болезни почек: клинико-прогностический подход G.Kh. Karabaeva, A.E. Kholbayev Assessment of cardiovascular risk in chronic kidney disease: clinical and prognostic approach Г.Х. Карабаева, А.Е. Холбаев Surunkali buyrak kasalligida kardiovaskulyar xavfni baholash: klinik va prognostik yondashuv.....</p>	50
10.	<p>Х.Б. Каримова, М.И. Усмонкулов, З.А. Насирова Морфофункциональное состояние сердечно-сосудистой системы в послеоперационном периоде у детей с тетрадой Фалло Kh.B. Karimova, M.I. Usmonkulov, Z.A. Nasirova Morphofunctional state of the cardiovascular system in the postoperative period in children with Tetralogy of Fallot Х.Б. Каримова, М.И. Усмонкулов, З.А. Насирова Fallo tetradası bilan og'rigan bolalarda operatsiyadan keyingi davrda yurak-qon tomir tizimining morfofunktsional holati</p>	54
11.	<p>Г.А. Каспарова Эффективность интеграции симуляционной практики в медицинское образование: влияние на компетенции студентов-медиков и безопасность пациентов G.A. Kasparova The effectiveness of integrating simulation-based practice into medical education: impact on medical students' competencies and patient safety Г.А. Каспарова Tibbiy ta'limda simulyatsion amaliyotni integratsiya qilishning samaradorligi: tibbiyot talabalarining kompetensiyalari va bemorlar xavfsizligiga ta'siri.....</p>	58
12.	<p>З.А. Насырова, Ш.Р. Шарипов Роль эндотелиальной дисфункции и микроциркуляторных нарушений в формировании толерантности к физической нагрузке у пациентов с синдромом замедленного коронарного кровотока Z.A. Nasyrova, Sh.R. Sharipov Role of endothelial dysfunction and microcirculatory disorders in the formation of exercise tolerance in patients with coronary slow flow phenomenon Z.A. Nasirova, Sh.R. Sharipov Sekinlashgan koronar qon oqimi sindromi bo'lgan bemorlarda endotelial disfunktsiya va mikrosirkulyatsiya buzilishlarining jismoniy yuklamaga chidamlilik shakllanishidagi roli.....</p>	63
13.	<p>М.Б. Норматов Влияние уровня гликемического контроля на диастолическую функцию и ремоделирование левого желудочка у пациентов с сахарным диабетом 2 типа с учетом артериальной гипертензии M.B. Normatov Impact of glycemic control level on diastolic function and left ventricular remodeling in patients with type 2 diabetes mellitus considering arterial hypertension M.B. Normatov 2-toifa qandli diabet bilan kasallangan bemorlarda arterial gipertenziyani hisobga olgan holda glikemik nazorat darajasining chap qorincha diastolik funktsiyasi va remodellashuviga ta'siri.....</p>	69
14.	<p>Д.А. Носирова, М.Х. Хайриллоева Современные подходы к реабилитации после катетерной абляции при фибрилляции предсердий на фоне ишемической болезни сердца D.A. Nosirova, M.Kh. Khayrilloeva Modern approaches to rehabilitation after catheter ablation in atrial fibrillation associated with coronary artery disease Д.А. Носирова, М.Х. Хайриллоева Yurak ishemik kasalligi fonida bo'lmachalar fibrillyatsiyasida kateter ablatatsiyadan keyin rehabilitatsiyaning zamonaviy yondashuvlari.....</p>	73
15.	<p>Э.Н. Ташкенбаева, И.И. Салиева Клинические предикторы прогрессирования хронической болезни почек у пациентов с сахарным диабетом после аортокоронарного шунтирования E.N. Tashkenbaeva, I.I. Salieva Clinical predictors of chronic kidney disease progression in patients with diabetes mellitus after coronary artery bypass grafting Э.Н. Ташкенбаева, И.И. Салиева Qandli diabetli bemorlarda aortokoronar shuntlashdan keyin surunkali buyrak kasalligi progressiyasining klinik prediktorlari.....</p>	77
16.	<p>Э.Н. Ташкенбаева, С.Н. Мухтаров, Э.Э. Эргашзода Клинико-прогностическое значение нарушений функции почек в прогрессировании ишемической болезни сердца и разработка клинико-ориентированной системы поддержки принятия решений на основе искусственного интеллекта E.N. Tashkenbaeva, S.N. Muxtarov, E.E. Ergashzoda Clinical and prognostic significance of renal dysfunction in the progression of ischemic heart disease and development of an AI-based clinical decision support system Э.Н. Ташкенбаева, С.Н. Мухтаров, Э.Э. Эргашзода Yurak ishemik kasalligi rivojlanishida buyrak funksiyasi buzilishining klinik-prognostik ahamiyati va sun'iy intellekt asosida klinik qaror qabul qilish tizimini ishlab chiqish.....</p>	83

17.	<p>Э.Н. Ташкенбаева, А.И. Мухиддинов, Ш.Х. Бекмуродов, М.А. Мухтарова, А.Ф. Уралов, Ш.А. Усаров Методы и критерии диагностики артериальной гипертензии у пациентов с риском кардиоренальных осложнений E.N. Tashkenbaeva, A.I. Mukhiddinov, Sh.Kh. Bekmurodov, M.A. Mukhtarova, A.F. Uralov, Sh.A. Usarov Diagnostic methods and criteria for hypertension in patients at risk of cardiorenal complications E.N. Tashkenbaeva, A.I. Muxiddinov, Sh.X. Bekmurodov, M.A. Muxtarova, A.F. Uralov, Sh.A. Usarov Kardiorrenal asoratlar xavfi bo'lgan bemorlarda arterial gipertenziya kasalligini tashxislash usullari va diagnostik mezonlari.....</p>	88
18.	<p>С.К. Туйчиева, Э.Н. Ташкенбаева Клинико-иммунологические особенности ишемической болезни сердца у женщин в зависимости от наличия метаболического синдрома S.K. Tuychieva, E.N. Tashkenbaeva Clinical and immunological features of ischemic heart disease in women depending on the presence of metabolic syndrome S.K. Tuychiyeva, E.N. Tashkenbaeva Ayollarda metabolik sindrom mavjudligiga bog'liq holda yurak ishemik kasalligining klinik-immunologik xususiyatlari</p>	93
19.	<p>Ф.О. Хасанжанова, Ж.А. Ризаев, Э.Н. Ташкенбаева Реабилитации больных трудоспособного возраста после комплексной коррекции ИБС на фоне аномальных отхождений коронарных артерий F.O. Xasanjanova, J.A. Rizayev, E.N. Tashkenbaeva Mehnatga layoqatli yoshdagi bemorlarda YuIKni koronar arteriyaning anomal chiqishlari fonida kompleks korreksidan keyingi reabilitatsiyasi F.O. Xasanjanova, J.A. Rizayev, E.N. Tashkenbaeva Rehabilitation of working-age patients after comprehensive correction of coronary artery disease in the presence of anomalous origin of the coronary arteries.....</p>	98
20.	<p>У.Е. Чарипова, Д.М. Рахманова, Т.А. Арыстанова Фармакологическое обоснование комбинированного применения статинов и глицирризиновой кислоты U.E. Charipova, D.M. Rakhmanova, T.A. Arystanova Pharmacological rationale for the combined use of statins and glycyrrhizic acid U.E. Charipova, D.M. Rakhmanova, T.A. Arystanova Statinlar va glitsirrizin kislotasining kombinatsiyalangan qo'llanilishining farmakologik asoslari.....</p>	102
21.	<p>С.Х.Ярмухамедова Особенности эхокардиографических и молекулярных показателей у больных артериальной гипертензией S.Kh. Yarmukhamedova Characteristics of echocardiographic and molecular parameters in patients with arterial hypertension S.X. Yarmuhamedova Arterial gipertenziya bilan bemorlarda ekokardiografik va molekular parametrelarning xususiyatlari.....</p>	109



ISSN: 2181-0974

www.tadqiqot.uz

JOURNAL OF CARDIORESPIRATORY RESEARCH

ЖУРНАЛ КАРДИОРЕСПИРАТОРНЫХ ИССЛЕДОВАНИЙ

Каспарова Гаянэ Артуровна

ассистент кафедры Симуляционного обучения
Самаркандский государственный медицинский университет
Самарканд, Узбекистан

ЭФФЕКТИВНОСТЬ ИНТЕГРАЦИИ СИМУЛЯЦИОННОЙ ПРАКТИКИ В МЕДИЦИНСКОЕ ОБРАЗОВАНИЕ: ВЛИЯНИЕ НА КОМПЕТЕНЦИИ СТУДЕНТОВ-МЕДИКОВ И БЕЗОПАСНОСТЬ ПАЦИЕНТОВ

For citation: G.A. Kasparova. The Effectiveness of Integrating Simulation-Based Practice into Medical Education: Impact on Medical Students' Competencies and Patient Safety. . Journal of cardiorespiratory research. 2026, vol 7, issue 2/1.



<http://dx.doi.org/10.26739/2181-0974/2026/7/2/1/11>

Аннотация

Цель исследования. Оценить влияние интеграции симуляционной практики в обучение базовой сердечно-легочной реанимации (СЛР) на уровень клинических компетенций студентов-медиков и потенциальный вклад в повышение безопасности пациентов по сравнению с традиционным теоретическим обучением.

Материалы и методы. Проведено проспективное сравнительное исследование. В исследование включены 312 студентов 4-го курса Самаркандского государственного медицинского университета (возраст 20–23 года), рандомизированных в две группы. Контрольная группа (n = 156) получала только теоретические знания по СЛР в соответствии с актуальными рекомендациями (лекции, разбор алгоритмов, видео-демонстрации). Основная группа (n = 156) проходила комбинированное обучение: те же теоретические занятия плюс практическая отработка на высокоточных манекенах-симуляторах (с обратной связью по глубине, частоте компрессий, полноте декомпрессии, вентиляции). Оценка проводилась через 2 недели после завершения курса с использованием стандартизированной чек-листовой оценки навыков СЛР (максимум 20 баллов), теста знаний (максимум 30 баллов) и симулированного сценария с фиксацией времени до начала компрессий, качества СЛР и ошибок, влияющих на безопасность пациента. Статистическая обработка выполнена с использованием t-критерия Стьюдента и критерия хи-квадрат (уровень значимости $p < 0,05$).

Результаты. Средний балл по чек-листу навыков СЛР в основной группе составил $17,4 \pm 1,8$ балла против $11,2 \pm 2,9$ балла в контрольной группе ($p < 0,001$). Качество компрессий (глубина 5–6 см, частота 100–120 в минуту, полнота отдачи $>90\%$) достигнуто у 87 % студентов основной группы и лишь у 31 % контрольной ($p < 0,001$). Среднее время до начала компрессий составило 12 ± 4 с против 28 ± 11 с ($p < 0,001$). Ошибки, потенциально угрожающие безопасности пациента (недостаточная частота, чрезмерная вентиляция, неправильная позиция рук), зарегистрированы у 18 % в основной группе и у 69 % в контрольной ($p < 0,001$). Различий в уровне теоретических знаний между группами не выявлено ($26,1 \pm 2,4$ против $25,3 \pm 2,7$ балла, $p = 0,18$).

Выводы. Интеграция симуляционной практики в обучение СЛР значительно превосходит традиционное теоретическое обучение по формированию практических компетенций студентов-медиков. Полученные данные свидетельствуют о потенциале симуляционного метода в снижении риска ошибок при оказании помощи реальным пациентам и повышении безопасности пациентов.

Ключевые слова: симуляционное обучение, сердечно-легочная реанимация, студенты-медики, клинические компетенции, безопасность пациентов, сравнительное исследование

Kasparova Gayane Arturovna

Assistant of the Department of Simulation Training
Samarkand
State Medical University
Samarkand, Uzbekistan

THE EFFECTIVENESS OF INTEGRATING SIMULATION-BASED PRACTICE INTO MEDICAL EDUCATION: IMPACT ON MEDICAL STUDENTS' COMPETENCIES AND PATIENT SAFETY

Abstract

Purpose of the study. To evaluate the impact of integrating simulation-based practice into basic cardiopulmonary resuscitation (CPR) training on the level of clinical competencies among medical students and its potential contribution to improving patient safety compared to traditional theoretical training alone.

Materials and Methods. A prospective comparative study was conducted. The study included 312 fourth-year medical students (aged 20–23 years) from Samarkand state medical university, randomized into two groups. The control group (n = 156) received only theoretical knowledge on CPR in accordance with current guidelines (lectures, algorithm reviews, video demonstrations). The main group (n = 156) underwent combined training: the same theoretical sessions plus practical training on high-fidelity manikins with feedback (depth, rate, recoil, ventilation). Assessment was performed 2 weeks after course completion using a standardized checklist-based CPR skills evaluation (maximum 20 points), knowledge test

(maximum 30 points), and simulated scenario with recording of time to first compression, CPR quality, and patient safety-related errors. Statistical analysis was performed using Student's t-test and chi-square test (significance level $p < 0.05$).

Results. The mean checklist score for CPR skills in the main group was 17.4 ± 1.8 points versus 11.2 ± 2.9 points in the control group ($p < 0.001$). High-quality CPR (depth 5–6 cm, rate 100–120/min, recoil $>90\%$) was achieved by 87% of students in the main group and only 31% in the control group ($p < 0.001$). Mean time to first compressions was 12 ± 4 s versus 28 ± 11 s ($p < 0.001$). Errors potentially threatening patient safety (inadequate rate, excessive ventilation, incorrect hand position) occurred in 18% of the main group and 69% of the control group ($p < 0.001$). No differences were found in theoretical knowledge levels between groups (26.1 ± 2.4 vs 25.3 ± 2.7 points, $p = 0.18$).

Conclusions. Integration of simulation-based practice into CPR training significantly outperforms traditional theoretical training in developing practical competencies among medical students. The findings indicate the high potential of simulation methods in reducing error risk during real patient care and enhancing patient safety.

Keywords: simulation-based training, cardiopulmonary resuscitation, medical students, clinical competencies, patient safety, comparative study.

Kasparova Gayane Arturovna
 assistant kafedrası Simulyatsion o'qitish
 Samarqand Davlat Tibbiyot Universiteti
 Samarqand, O'zbekiston

TIBBIY TA'LIMDA SIMULYATSION AMALIYOTNI INTEGRATSIYA QILISHNING SAMARADORLIGI: TIBBIYOT TALABALARINING KOMPETENSIYALARI VA BEMORLAR XAVFSIZLIGIGA TA'SIRI

Annotatsiya

Tadqiqot maqsadi. Bazaviy yurak-o'pka reanimatsiyasi (YO'R) o'qitishga simulyatsiya amaliyotini integratsiya qilishning tibbiyot talabalarining klinik kompetensiyalari darajasiga ta'sirini hamda an'anaviy nazariy o'qitish bilan solishtirganda bemorlar xavfsizligini oshirishga qo'shadigan hissasini baholash.

Material va usullar. Prospektiv solishtirma tadqiqot o'tkazildi. Tadqiqotga Samarqand davlat tibbiyot universitetining 4-kurs talabalaridan 312 nafari (20–23 yoshi) kiritildi, ular ikki guruhga tasodifiy randomizatsiya qilindi. Nazorat guruhi ($n = 156$) faqat YO'R bo'yicha nazariy bilimlarni oldi (hozirgi tavsiyalarga muvofiq ma'ruzalar, algoritmlarni tahlil qilishni, video-namoyishlar). Asosiy guruhi ($n = 156$) aralash o'qitishdan o'tdi: nazariy mashg'ulotlarga qo'shimcha ravishda yuqori aniqlikdagi maneken-simulyatorlarda amaliy mashqlar (kompresiyalar chuqurligi, tezligi, to'liq qaytishi, ventilatsiya bo'yicha tez fikr-mulohaza bilan). Kurs tugagandan 2-hafta o'tgach baholash o'tkazildi: YO'R ko'nikmalarini standartlashtirilgan "check-list" orqali baholash (yuqori natijasi 20-ball), bilimlar testi (yuqori natijasi-30 ball) va simulyatsiyalangan stsenariyda birinchi kompressiyagacha bo'lgan vaqt, YO'R sifati va bemor xavfsizligiga ta'sir qiladigan xatolarni qayd etish. Statistik ishlov berish Student t-kriteriyasi va xi-kvadrat kriteriyasi yordamida amalga oshirildi (ahamiyat darajasi $p < 0,05$).

Natijalar. Asosiy guruhida YO'R ko'nikmalari "check-listi" bo'yicha o'rtacha baholari $17,4 \pm 1,8$ ballni tashkil etdi, nazorat guruhida esa $11,2 \pm 2,9$ ball ($p < 0,001$). Yuqori sifatli kompressiyalar (chuqurlik 5–6 sm, tezlik 100–120 daqiqada, to'liq qaytish $>90\%$) asosiy guruhi talabalarining 87 %ida va nazorat guruhining faqat 31 %ida qayd etildi ($p < 0,001$). Birinchi kompressiyagacha o'rtacha vaqt 12 ± 4 soniyaga qarshi 28 ± 11 soniya ($p < 0,001$). Bemor xavfsizligiga potentsial tahdid soluvchi xatolar (yetarli tezlik yo'qligi, haddan tashqari ventilatsiya, qo'llarning noto'g'ri joylashuvi) asosiy guruhida 18 % va nazorat guruhida 69 % holatlarda kuzatildi ($p < 0,001$). Guruhlar o'rtasida nazariy bilimlar darajasida katta farq aniqlanmadi ($26,1 \pm 2,4$ ga qarshi $25,3 \pm 2,7$ ball, $p = 0,18$).

Xulosalar. YO'R o'qitishga simulyatsiya amaliyotini integratsiya qilish tibbiyot talabalarining amaliy kompetensiyalarini shakllantirishda an'anaviy nazariy o'qitishdan sezilarli darajada ustun turadi. Olingan ma'lumotlar simulyatsion usulning haqiqiy bemorlarga yordam ko'rsatishda xatolar xavfini kamaytirish va bemorlar xavfsizligini oshirishdagi yuqori potentsialini ko'rsatadi.

Kalit so'zlar: simulyatsion o'qitish, yurak-o'pka reanimatsiyasi, tibbiyot talabalari, klinik kompetensiyalar, bemorlar xavfsizligi, solishtirma tadqiqot

Relevance.

Sudden cardiac arrest remains one of the leading causes of death worldwide. According to global meta-analyses, survival to hospital discharge for patients with out-of-hospital cardiac arrest (OHCA) who receive cardiopulmonary resuscitation (CPR) averages 8.8–10.4% [1, 11]. In recent years, a modest positive trend has been observed: in 2024–2025, 30-day survival in several European countries and the United States reached 9.5%, but in most regions worldwide, it still does not exceed 10% [11]. In children, outcomes are somewhat better (13.2% in the United States based on 2023 data), yet survival remains extremely low—one in eight children [1, 11]. The key factor directly determining outcome is the quality of basic life support (BLS) CPR: correct compression depth and rate, full chest recoil, minimal interruptions, adequate ventilation, and timely defibrillation. High-quality CPR can increase the probability of return of spontaneous circulation (ROSC) by 2–3 times and substantially improve chances of survival with good neurologic outcome [5, 14].

Despite this, the quality of CPR performed by both laypersons and young physicians in real clinical practice remains unsatisfactory. Numerous studies show that even medical school graduates commit critical errors: inadequate compression depth (<5 cm) in 40–60% of cases, incorrect rate (<100 or >120 /min) in 30–50%, prolonged pauses (>10 s) in 25–40%, incorrect hand position, and excessive ventilation leading to hyperventilation and reduced venous return [25]. These errors directly correlate with worse patient outcomes and represent one of the main causes of preventable mortality [25]. The traditional model of

medical education—lectures, algorithm reviews, and passive video demonstrations—primarily builds theoretical knowledge but fails to develop motor skills or stress resilience in realistic conditions. Skills acquired through theory alone decay rapidly: performance drops by 40–60% within 3–6 months after training [4].

The 2025 American Heart Association (AHA) and European Resuscitation Council (ERC) guidelines (updated ILCOR Consensus) for the first time at the consensus level emphasized the priority of simulation-based training and feedback devices as mandatory components of healthcare provider preparation [14, 15]. In 2025, new recommendations were introduced for rapid-cycle deliberate practice and in-situ simulation directly in clinical departments [14, 15]. These changes reflect accumulated evidence: simulation allows repeated scenario practice, immediate objective feedback from manikins (data on depth, rate, recoil, ventilation volume), reduced time to compressions, and minimized critical errors without risk to real patients [2, 3, 6, 30, 31]. Meta-analyses from 2024–2025 confirm that high-fidelity simulation outperforms traditional training in developing practical CPR skills among medical students and junior staff, improves self-efficacy, and reduces potentially life-threatening errors [2, 3, 30, 31].

In post-Soviet countries, including Uzbekistan, the situation remains particularly relevant. Despite the establishment of modern simulation centers in leading medical universities (Tomsk State Medical University, Pirogov Russian National Research Medical University, Tashkent Medical Academy, etc.), the traditional theoretical approach still predominates. Clinical bases for practicing emergency skills are

limited, and the shortage of beds in intensive care units prevents students from sufficiently observing or participating in real CPR cases. As a result, graduates enter clinical practice with high theoretical knowledge but low readiness for independent action in critical situations. This directly affects patient safety: local audits show errors during initial resuscitation by young specialists in 50–70% of cases [16, 17].

The post-pandemic period 2020–2025 further accelerated the global shift to simulation technologies: remote and hybrid formats, virtual/augmented reality (VR/AR), and digital patient twins have become integral to training [9, 10]. However, in most medical universities in the CIS region, simulation is still used fragmentarily—as an elective or for accreditation—rather than as a systematic foundation of education. The lack of local prospective studies with clear comparative design (theory vs theory + simulation) hinders the implementation of evidence-based approaches in curricula. The present study addresses this gap by providing the first data on the comparative effectiveness of the two training models in a regional medical university setting. The results have both pedagogical and socio-economic significance: investments in simulation centers pay off through reduced complications, shorter adaptation periods for young specialists, and, most importantly, improved survival in sudden cardiac arrest [5, 14].

Thus, the relevance of the problem stems from the combination of high global and regional OHCA mortality, proven inadequacy of traditional theoretical training, new 2025 international guidelines mandating simulation use, and the need for local evidence to revise educational standards in CIS medical universities.

Purpose of the study.

To assess the impact of combined (theory + simulation-based practice) CPR training on the level of practical competencies among medical students and patient safety-related indicators compared to theoretical training alone.

Materials and Methods.

The study was conducted at the simulation center of Samarkand state medical university in 2025. Participants were 312 fourth-year

students with no prior independent CPR experience on simulators. Randomization was performed using random numbers. Both groups completed the same theoretical block (6 academic hours: BLS algorithm per 2020–2025 guidelines, error analysis, video cases). The main group additionally completed 6 hours of practical sessions on manikins with CPR quality sensors (Laerdal SimMan). Assessment was conducted by a blinded expert using a unified checklist (AHA/ERC-based) with 20 items. CPR quality parameters were also recorded via simulator software. Statistical analysis was performed using SPSS 27.0.

Results.

The study results demonstrated clear superiority of the combined approach (theory + simulation-based practice) over purely theoretical training across nearly all evaluated parameters, with no differences in theoretical knowledge. This confirms that simulation's advantage lies precisely in forming motor skills, decision-making speed, and error minimization directly affecting patient safety.

Table 1 presents the main comparative indicators of theoretical knowledge and practical CPR skills between the two groups. As shown in Table 1, the mean total checklist score for CPR skills (maximum 20 points) in the main group was 17.4 ± 1.8 points, 55% higher than in the control group (11.2 ± 2.9 points, $p < 0.001$). The proportion of students fully meeting high-quality CPR criteria (compression depth 5–6 cm, rate 100–120/min, chest recoil >90%, minimal pauses) reached 87% in the main group versus only 31% in the control group ($p < 0.001$). Time to first chest compressions—a critical survival indicator—was reduced nearly 2.5-fold in the simulation group: 12 ± 4 seconds versus 28 ± 11 seconds ($p < 0.001$). The frequency of critical errors potentially threatening patient safety was 18% in the main group versus 69% in the control group ($p < 0.001$). Theoretical knowledge levels (test maximum 30 points) did not differ between groups (26.1 ± 2.4 vs 25.3 ± 2.7 points, $p = 0.18$), confirming equivalent baseline theoretical preparation and isolating the effect to simulation practice. Subjective confidence in skills (10-point scale) was also substantially higher in the main group— 8.7 ± 0.9 versus 5.2 ± 1.4 ($p < 0.001$).

Table 1. Comparison of main theoretical knowledge and practical CPR skills indicators between groups.

Table 2 details objective compression quality parameters recorded by the simulator software (Laerdal SimMan). Mean compression depth in

Parameter	Main group (n=156)	Control group (n=156)	p-value
Theoretical test (points, max 30)	26.1 ± 2.4	25.3 ± 2.7	0.18
Total CPR skills checklist score (max 20)	17.4 ± 1.8	11.2 ± 2.9	< 0.001
Time to first compressions (seconds)	12 ± 4	28 ± 11	< 0.001
Achievement of high-quality CPR (%)	87	31	< 0.001
Frequency of critical errors (%)	18	69	< 0.001
Subjective confidence in skills (1–10 scale)	8.7 ± 0.9	5.2 ± 1.4	< 0.001

the main group was 5.4 ± 0.3 cm (fully compliant with 5–6 cm recommendations) versus only 4.1 ± 0.7 cm in the control group ($p < 0.001$). Mean compression rate was 108 ± 6 /min versus 92 ± 12 /min ($p < 0.001$). Chest recoil (>90%) occurred in 89% of cycles in the main group and only 34% in the control group ($p < 0.001$). Chest compression

fraction (>80%) exceeded the target in 92% of main participants versus 48% in controls. Hyperventilation (>10 breaths/min) was recorded in just 8% of simulation-trained students versus 54% in the control group ($p < 0.001$). These data convincingly demonstrate clinically meaningful improvement in basic CPR quality due to simulation integration.

Table 2. Objective chest compression quality parameters from simulator software.

Parameter	Main group (n=156)	Control group (n=156)	p-value
Mean compression depth (cm)	5.4 ± 0.3	4.1 ± 0.7	< 0.001
Mean compression rate (per minute)	108 ± 6	92 ± 12	< 0.001
Chest recoil (>90%) (%)	89	34	< 0.001

Chest compression fraction (>80%) (%)	92	48	< 0.001
Hyperventilation (>10/min) (%)	8	54	< 0.001

Discussion. The obtained results are fully consistent with contemporary international studies and the 2025 guidelines. Meta-analyses conducted in 2024–2025 demonstrate that simulation-based training improves CPR performance quality among medical students by 40–70% compared to traditional methods, which aligns perfectly with our findings (a 55% increase in checklist scores). In particular, the pilot study by Bermúdez (2025) showed that simulation led to a 1.6-fold improvement in skills (RR = 1.6) and a reduction in the number of errors, similar to our observed rates of 18% versus 69%.

The mechanisms underlying the superiority of simulation are well established: the deliberate practice method, combined with immediate feedback from manikin sensors, enables the achievement of automatic skill execution at the level of muscle memory — something that cannot be accomplished through lectures alone. Unlike traditional training, where a student observes a demonstration only once or twice, simulation involves 30–50 repetitions of the scenario with real-time error correction. This is particularly crucial for developing “muscle memory” during chest compressions and for minimizing cognitive load in high-stress situations.

Our findings further contribute to the evidence on translational effects: the reduction in the frequency of critical errors in a simulated environment correlates with a decrease in complications among real patients.

The limitations of the study should be openly acknowledged. First, the assessment was conducted only once, two weeks after training, with no analysis of skill retention at 3, 6, or 12 months. Second, the study was performed in the controlled environment of a simulation center, without evaluation in real clinical settings (in-situ simulation). However, these limitations are typical of most prospective studies in medical education research and do not diminish the value of the evidence obtained. The study’s strengths include randomization, blinded expert assessment, and objective metrics provided by the simulator software, which eliminate subjectivity.

In the context of medical education in the CIS countries, the results carry particular importance. Given the shortage of clinical training sites, simulation is no longer merely a supplement but a necessary alternative that compensates for the lack of exposure to real patients. The 2025 AHA/ERC/ILCOR recommendations explicitly emphasize the need to implement feedback devices and rapid-cycle deliberate practice specifically within undergraduate medical training. Our data provide justification for moving from optional or sporadic use of simulation to its mandatory integration into the curriculum of disciplines such as

“Anesthesiology and Intensive Care,” “Emergency Medicine,” and “Internal Medicine.”

The prospects for future research are clear: multicenter studies with larger sample sizes, evaluation of long-term skill retention, incorporation of VR/AR technologies, and — most importantly — translational studies assessing the impact of simulation-based training of graduates on real patient outcomes in hospitals and prehospital settings. Only such evidence will ultimately enable a fundamental revision of educational standards and establish simulation-based training as the cornerstone of preparing the next generation of physicians.

Conclusions.

1. Integration of simulation-based practice into basic CPR training significantly outperforms traditional theoretical training across all key practical competency parameters among medical students: CPR quality, initiation speed, minimization of critical errors, and subjective skill confidence.

2. Theoretical knowledge is formed equally in both models, but simulation alone ensures translation of knowledge into durable motor skills compliant with international high-quality CPR standards.

3. The results indicate high potential of simulation in enhancing patient safety: more than 3.5-fold reduction in life-threatening errors suggests expected improvement in real resuscitation outcomes.

4. In modern CIS medical universities with limited clinical bases and rising graduate competency requirements, transitioning to mandatory hybrid (theory + simulation) training for emergencies is necessary and evidence-based.

5. It is recommended to include simulation-based CPR training in the compulsory curriculum of all medical universities using high-fidelity manikins with feedback, regular refresher sessions, and integration into final state certification.

6. Further development should encompass expansion to other critical skills (intubation, defibrillation, trauma care), VR/AR implementation, and translational studies confirming simulation training’s impact on real patient survival.

Thus, this study provides compelling local evidence of simulation-based training effectiveness and justifies systemic changes in medical education to improve physician preparation quality and patient safety.

Список литературы / References/ Iqtiboslar:

1. Elendu C. The impact of simulation-based training in medical education // *Ann Med Surg (Lond)*. 2024. Vol. 86, № 8. P. 4567–4576.
2. Bermúdez R. S. Effectiveness of Simulation-Based CPR Training Among Medical Students: A Pilot study // *Eur. J. Public Health*. 2025. Vol. 35, Suppl. 4. P. ckaf161.1453.
3. Gabbouj S. B. Effect of Simulation-Based Education of Adult BLS-CPR on Nursing Students // *Adv. Med. Educ. Pract.* 2025. Vol. 16. P. 123–134.
4. McCoy C. E. Randomized Controlled Trial of Simulation vs. Standard Training for Medical Students // *West. J. Emerg. Med.* 2019. Vol. 20, № 1. P. 165–174.
5. Alharbi A. The effectiveness of simulation-based learning (SBL) on nursing student’s outcomes // *BMC Med. Educ.* 2024. Vol. 24. P. 6080.
6. Cortegiani A. In situ simulation for cardiopulmonary resuscitation training // *Resusc. Plus*. 2025. Vol. 22. P. 100314.
7. Vermylen J. H. Competency-Based Simulation Training for Procedural Skills // *Simul. Healthc.* 2024. Vol. 19, № 4. P. 215–223.
8. Coelho D. L. Realistic simulation and medical students’ performance // *Adv. Physiol. Educ.* 2024. Vol. 48, № 1. P. 113–120.
9. Agostino S. Impact of Simulation-Based and Flipped Classroom Training // *Educ. Sci.* 2024. Vol. 15, № 1. P. 31.
10. Leszczyński P. K. Effectiveness of teaching basic life support resuscitation using virtual reality // *BMC Med. Educ.* 2025. Vol. 25. P. 7827.
11. Yan S. et al. The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: a systematic review and meta-analysis // *Resuscitation*. 2020. Vol. 152. P. 1–12.
12. Herrero-Izquierdo L. et al. Effectiveness of high-fidelity clinical simulation in cardiopulmonary resuscitation training: A systematic review and meta-analysis // *Clin. Simul. Nurs.* 2025. Vol. 98. P. 1–12.

13. Sun R. et al. Effectiveness of virtual reality and augmented reality in CPR training: a systematic review and meta-analysis // *BMC Med. Educ.* 2024. Vol. 24. P. 572.
14. Highlights of the 2025 American Heart Association Guidelines for CPR and ECC // *Circulation.* 2025.
15. Executive Summary: 2025 International Liaison Committee on Resuscitation Consensus // *Circulation.* 2025.
16. Зелинский С. С. Анализ эффективности обучения врачей практическим навыкам базовой сердечно-легочной реанимации взрослых // *Медицинская симуляция.* 2025. № 3. С. 45–52.
17. Горшков М. Д. Симуляционное обучение по специальности «Лечебное дело»: практическое руководство. М.: ВРНИМУ, 2025. 128 с.
18. Nasiri S. et al. Impact of flipped classroom-based simulation of CPR on self-confidence, satisfaction, knowledge, and skill of nursing students // *BMC Med. Educ.* 2025. Vol. 25. Art. 7525.
19. Yang X. et al. Effect of simulation-based stratified first aid training on physicians' first aid skills and confidence // *Front. Med.* 2025. Vol. 12. Art. 12590788.
20. Molinari P. A. et al. A Simulation-Based Randomized Controlled Trial in Schools: Retention of CPR Skills Six Months After Training // *Resusc. Plus.* 2025. Vol. 23. Art. 1002796.
21. Demirtas A. et al. Effectiveness of simulation-based cardiopulmonary resuscitation training on knowledge and skills of nursing students // *Nurse Educ. Today.* 2020. Vol. 93. P. 104567.
22. Lim X. M. A. et al. The Effectiveness of Technology-Based Cardiopulmonary Resuscitation Training for School-Aged Children: Systematic Review and Meta-Analysis // *JMIR.* 2022. Vol. 24, № 12. e36423.
23. Patil A. et al. The impact of simulation-based training on the knowledge and skills of postgraduate medical students in the management of cardiac arrest // *Anaesth. Pain Intensive Care.* 2023. Vol. 27, № 4. P. 2258.
24. Zeng Q. et al. Efficacy of high-fidelity simulation in advanced life support training: a systematic review and meta-analysis // *BMC Med. Educ.* 2023. Vol. 23. Art. 4654.
25. Cheng P. et al. The Effects of Serious Games on Cardiopulmonary Resuscitation Training and Education: Systematic Review With Meta-Analysis of Randomized Controlled Trials // *JMIR Serious Games.* 2024. Vol. 12. e52990.
26. Artero P. M. A. et al. Efficiency of virtual reality for cardiopulmonary resuscitation training of adult laypersons: A systematic review // *Medicine (Baltimore).* 2023. Vol. 102, № 3. e32548.
27. Tank D. Y. et al. From games to high fidelity: A comparative study of CPR simulation methods in nursing education // *Clin. Simul. Nurs.* 2025. Vol. 99. Art. 100510.
28. Koçkaya P. D. et al. Empowering medical students: bridging gaps with high-fidelity simulation in CPR training // *BMC Med. Educ.* 2024. Vol. 24. Art. 11412062.
29. Laco R. B. et al. Simulation-Based Training Program to Improve Cardiopulmonary Resuscitation and Teamwork Skills // *Mil. Med.* 2022. Vol. 187, № 5-6. P. e764–e770.
30. Turan D. et al. Simulation-based education in paramedic training: effects on clinical performance and self-perceived competence // *BMC Med. Educ.* 2026. Vol. 26. Art. 85415.
31. Wang C. et al. Using multimedia tools and high-fidelity simulations to enhance medical students' resuscitation skills // *BMJ Open.* 2016. Vol. 6, № 9. e012195.