Article submitted: 08.01.2025
Accepted for publication: 04.03.2025
UDC: 616-089.5:614.2(574)
IRSTI: 76.29.44
DOI: 10.24412/1609-8692-2025-1-61-69

Article type: *review article*
(narrative analytical literature review
with elements of secondary data synthesis)

ASSESSMENT OF ANESTHESIOLOGICAL CARE FOR THE POPULATION. A LITERATURE REVIEW

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Introduction. Anesthesiological care is a critical component of safe surgical and procedural medicine and is closely linked to patient safety, the availability of monitoring and life-support technologies, professional competence, and adherence to clinical standards. Increasing numbers of older patients, patients with cancer and severe comorbidities, and emergency admissions are increasing the demand for anesthesiology, resuscitation, and intensive care services.
Objective. To analyze the level and organizational determinants of anesthesiological care for the population, summarize international and Kazakhstan experience, and identify priority directions for improving quality, safety, staffing, equipment, and standardization of care.
Materials and Methods. A narrative analytical review and secondary synthesis of the 33 sources included in the manuscript were performed. The evidence base comprised international publications on anesthesia and patient safety, resuscitation and intensive care, workforce and hospital organization, together with official statistical and regulatory materials from Kazakhstan. Evidence was synthesized across patient safety, staffing, technical equipment, adherence to standards and protocols, and organizational capacity. Because the source manuscript does not provide a reproducible database search strategy, search date, PRISMA flow diagram, or formal quality appraisal, the work is not classified as a systematic review or meta-analysis.
Results. The reviewed evidence shows that the safety and quality of anesthesiological care depend on professional staffing, modern anesthesia and monitoring equipment, availability of medicines and life-support technologies, and adherence to clinical standards and protocols. Kazakhstan has introduced regulatory measures and plans for national certification in accordance with international accreditation standards. At the same time, the available secondary data indicate continuing workforce imbalance, particularly between urban and rural areas, and a need for further development of quality monitoring and professional training.
Discussion. International evidence supports a systems approach in which patient safety depends not on a single intervention but on coordinated staffing, equipment, standardized clinical processes, audit, and continuous professional development. For Kazakhstan, these components should be evaluated together, with particular attention to regional access, emergency workload, and the growing demand for anesthesiology and intensive care.
Conclusion. Improving anesthesiological care requires coordinated development of workforce capacity, professional training and certification, modern technical infrastructure, clinical protocols, audit, and patient-safety monitoring. Standardized assessment of these components can support more equitable and effective anesthesiology services in Kazakhstan.
Keywords: anesthesiological care; patient safety; quality of care; anesthesiology; resuscitation; intensive care; healthcare organization; Kazakhstan.

ХАЛЫҚҚА КӨРСЕТІЛЕТІН АНЕСТЕЗИОЛОГИЯЛЫҚ КӨМЕК ДЕҢГЕЙІН БАҒАЛАУ. ӘДЕБИ ШОЛУ

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Кіріспе. Анестезиологиялық көмек хирургиялық және басқа да медициналық араласулардың қауіпсіздігін қамтамасыз ететін медициналық көмектің маңызды құрамдас бөлігі болып табылады. Оның сапасы пациент қауіпсіздігімен, мониторинг және өмірді қамтамасыз ету технологияларының қолжетімділігімен, мамандардың кәсіби даярлығымен және клиникалық стандарттарды сақтаумен тығыз байланысты. Егде жастағы, онкологиялық және ауыр қосалқы аурулары бар пациенттер санының, сондай-ақ шұғыл госпитализациялардың өсуі анестезиология, реанимация және қарқынды терапия қызметтеріне сұранысты арттырады.

Мақсаты. Халыққа көрсетілетін анестезиологиялық көмектің деңгейі мен ұйымдастырушылық факторларын талдау, халықаралық және Қазақстан тәжірибесін жинақтау және көмектің сапасын, қауіпсіздігін, кадрлық қамтамасыз етілуін, техникалық жарақтандырылуын және стандартталуын жетілдірудің басым бағыттарын айқындау.
Материалдар мен әдістер. Қолжазбаға енгізілген 33 дереккөзге нарративтік-аналитикалық шолу және екіншілік синтез жүргізілді. Дереккөздер анестезия және пациент қауіпсіздігі, реанимация және қарқынды терапия, кадрлық қамтамасыз ету және стационар қызметін ұйымдастыру жөніндегі халықаралық жарияланымдарды, сондай-ақ Қазақстанның ресми статистикалық және нормативтік материалдарын қамтыды. Деректер пациент қауіпсіздігі, кадрлық қамтамасыз ету, техникалық жарақтандыру, стандарттар мен хаттамаларды сақтау және ұйымдастырушылық әлеует бағыттары бойынша жүйеленді. Бастапқы қолжазбада қайталанатын іздеу стратегиясы, іздеу күні, PRISMA-схема және дереккөздердің сапасын формальды бағалау берілмегендіктен, жұмыс жүйелі шолу немесе мета-талдау ретінде жіктелмейді.
Нәтижелер. Талданған деректер анестезиологиялық көмектің қауіпсіздігі мен сапасы кәсіби кадрлармен қамтамасыз етуге, заманауи анестезиологиялық және мониторингтік жабдыққа, дәрілік заттар мен өмірді қамтамасыз ету технологияларының қолжетімділігіне, сондай-ақ клиникалық стандарттар мен хаттамаларды сақтауға тәуелді екенін көрсетті. Қазақстанда нормативтік шаралар қабылданып, халықаралық аккредиттеу стандарттарына сәйкес бірыңғай сертификаттау жүйесін дамыту жоспарланған. Сонымен қатар екіншілік деректер кадрлық теңгерімсіздіктің, әсіресе қала мен ауыл арасында, сақталатынын және сапаны мониторингтеу мен кәсіби даярлықты одан әрі жетілдіру қажеттігін көрсетеді.
Талқылау. Халықаралық деректер пациент қауіпсіздігін бір ғана клиникалық араласумен емес, кадрлық қамтамасыз ету, жабдық, стандартталған процестер, аудит және үздіксіз кәсіби дамуды біріктіретін жүйелік тәсілмен қамтамасыз ету қажеттігін көрсетеді. Қазақстан үшін өңірлік қолжетімділікті, шұғыл жүктемені және анестезиология мен қарқынды терапияға өсіп келе жатқан сұранысты ескере отырып, осы компоненттерді кешенді бағалау маңызды.
Қорытынды. Анестезиологиялық көмекті жетілдіру кадрлық әлеуетті, кәсіби даярлау мен сертификаттауды, заманауи техникалық инфрақұрылымды, клиникалық хаттамаларды, аудитті және пациент қауіпсіздігін мониторингтеуді үйлестіре дамытуды талап етеді. Осы компоненттерді стандартталған бағалау Қазақстанда анестезиологиялық көмектің қолжетімділігі мен тиімділігін арттыруға мүмкіндік береді.
Түйінді сөздер: анестезиологиялық көмек; пациент қауіпсіздігі; медициналық көмектің сапасы; анестезиология; реанимация; қарқынды терапия; денсаулық сақтауды ұйымдастыру; Қазақстан.

ОЦЕНКА УРОВНЯ АНЕСТЕЗИОЛОГИЧЕСКОЙ ПОМОЩИ НАСЕЛЕНИЮ. ОБЗОР ЛИТЕРАТУРЫ

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Введение. Анестезиологическая помощь является важной составляющей безопасного проведения хирургических и других медицинских вмешательств. Ее качество тесно связано с безопасностью пациентов, доступностью технологий мониторинга и жизнеобеспечения, профессиональной подготовкой персонала и соблюдением клинических стандартов. Рост числа пожилых пациентов, пациентов с онкологическими и тяжелыми сопутствующими заболеваниями, а также экстренных госпитализаций увеличивает потребность в анестезиологии, реанимации и интенсивной терапии.
Цель. Проанализировать уровень и организационные факторы оказания анестезиологической помощи населению, обобщить международный и казахстанский опыт и определить приоритетные направления совершенствования качества, безопасности, кадрового обеспечения, технической оснащенности и стандартизации помощи.
Материалы и методы. Проведен нарративно-аналитический обзор и вторичный синтез 33 источников, включенных в исходную рукопись. Рассматривались международные публикации по безопасности анестезии, реанимации и интенсивной терапии, кадровому обеспечению и организации стационарной помощи, а также официальные статистические и нормативные материалы Казахстана. Данные систематизированы по направлениям безопасности пациентов, кадрового обеспечения, технического оснащения, соблюдения стандартов и протоколов и организационной готовности. Поскольку в исходной рукописи не представлены воспроизводимая поисковая стратегия, дата поиска, PRISMA-схема и формальная оценка качества источников, работа не классифицируется как систематический обзор или метаанализ.
Результаты. Проанализированные данные показывают, что безопасность и качество анестезиологической помощи зависят от профессионального кадрового обеспечения, наличия современной анестезиологической и мониторинговой аппаратуры, лекарственных средств и технологий жизнеобеспечения, а также соблюдения клинических стандартов и протоколов. В Казахстане реализуются нормативные меры и планируется развитие единой системы сертификации в соответствии с международными стандартами аккредитации. Вместе с тем

вторичные данные указывают на сохраняющийся кадровый дисбаланс, особенно между городскими и сельскими территориями, и необходимость дальнейшего развития мониторинга качества и профессиональной подготовки.
Обсуждение. Международные данные подтверждают необходимость системного подхода, при котором безопасность пациентов обеспечивается сочетанием кадровых ресурсов, оборудования, стандартизированных клинических процессов, аудита и непрерывного профессионального развития. Для Казахстана эти компоненты целесообразно оценивать комплексно с учетом региональной доступности, экстренной нагрузки и растущей потребности в анестезиологической и интенсивной помощи.
Заключение. Совершенствование анестезиологической помощи требует согласованного развития кадрового потенциала, профессиональной подготовки и сертификации, современной технической инфраструктуры, клинических протоколов, аудита и мониторинга безопасности пациентов. Стандартизированная оценка этих компонентов может способствовать повышению доступности и эффективности анестезиологической помощи в Казахстане.
Ключевые слова: анестезиологическая помощь; безопасность пациентов; качество медицинской помощи; анестезиология; реанимация; интенсивная терапия; организация здравоохранения; Казахстан.

Introduction

Ensuring patient safety is not only an issue for anesthesiology. According to the World Health Organization's definition, patient safety means preventing potential harm to the patient and minimizing unnecessary harm during the provision of medical care [1].

The first public demonstration of anesthesia took place on October 16, 1846, but anesthesiology as a medical specialty developed in the second half of the twentieth century. The Copenhagen poliomyelitis epidemic of 1952 prompted major changes in respiratory support and intensive care. In 1953, Bjørn Aage Ibsen established a specialized intensive care unit in Copenhagen, an important milestone in the development of modern intensive care medicine [2, 3, 32].

To ensure high-quality anesthesiological and resuscitation care, doctors and nurses require appropriate professional training, a high level of life-support and monitoring technologies, and adequate provision of pharmaceuticals and medical equipment. According to W.L. Lanier, by 2000 global anesthesia-related mortality was approximately 1–2 cases per 200–300 thousand anesthetics [4], whereas in the 1960s–1970s it was approximately 1 case per 28 thousand anesthetics [5]. The development of anesthesiology and resuscitation, new technologies, and safer medications has contributed to a substantial decrease in anesthesia-related mortality.

Globally, cancer patients account for a substantial proportion of patients treated in anesthesiology, resuscitation, and intensive care settings [6]. In the United Kingdom, more than 200,000 adults and children are admitted to resuscitation and intensive care units annually [7]. Treatment costs have also risen; in the United States, critical-care expenditures increased markedly between 2000 and 2010 [8]. In Kazakhstan and worldwide, the increasing burden on anesthesiology, resuscitation, and intensive care departments is associated with the growing number of patients with cancer, as well as the increasing proportion of older patients and those with severe comorbidities [9].

Objective

To analyze the level and key determinants of anesthesiological care for the population, summarize international and Kazakhstan evidence on patient safety and service organization, and identify priority directions for improving staffing, equipment, professional training, standardization, and quality monitoring.

Scientific novelty

The novelty of this review lies in the integrated consideration of anesthesiological care as a system in which patient safety, workforce capacity, technical equipment, adherence to standards, audit, and organizational readiness are interdependent. The review brings together international evidence and Kazakhstan-specific regulatory and statistical data to formulate a structured set of dimensions for assessing the level of anesthesiological care and to identify areas requiring further national evaluation.

Materials and Methods

The work was conducted as a narrative analytical literature review with elements of secondary data synthesis. The analysis was based on the 33 bibliographic sources included in the original manuscript, comprising international scientific publications, professional and educational materials, official

statistics, and regulatory documents related to anesthesiology, resuscitation, intensive care, patient safety, workforce capacity, and hospital organization.

The evidence was synthesized across five analytical domains: 1) patient safety and adverse-event prevention; 2) workforce availability and professional competence; 3) technical equipment and monitoring; 4) adherence to clinical standards and protocols; and 5) organizational capacity and accessibility of anesthesiological and intensive-care services. The manuscript does not provide a reproducible database search strategy, a specified search date, a PRISMA flow diagram, or formal quality assessment of the included sources; therefore, the work should be interpreted as a narrative analytical review rather than a systematic review or meta-analysis.

Results

Patient safety and quality of anesthesiological care

Adverse events in anesthesiology may reflect interactions between patient-related risk, equipment and organizational constraints, and clinical processes; systemic barriers to safety should therefore be considered alongside individual professional competence [1, 10, 17]. Important measures for reducing adverse events include performing diagnostic and therapeutic interventions in accordance with clinical recommendations, following established standards and protocols for anesthesia and intensive therapy, and conducting medical audits [10-14].

Over the past decades, specialists in anesthesiology and reanimatology have played an important role in medical research and patient-safety initiatives and have actively participated in implementing standards of medical care [1, 15, 17].

In the last two decades, the development of anesthesiology has been shaped by two broad trends: increased attention to patient and anesthesia safety and the wider use of surgical technologies that reduce the need for prolonged inpatient care and shorten preoperative and postoperative periods, alongside a natural increase in anesthesiologists' workload [18, 19, 20, 21].

Growing demand and organizational role of the service

Modern achievements in medicine, particularly surgery, are closely linked to the development of anesthesiology and resuscitation. At the end of the twentieth and beginning of the twenty-first century, the widespread introduction of modern anesthesiological and resuscitation technologies expanded the scope of surgical care and increased the number of patients with surgical, obstetric, and therapeutic conditions who could receive complex treatment [22].

The growing demand for anesthesiological and resuscitation care demonstrates that hospitals providing surgical care cannot function effectively without anesthesiology-resuscitation departments or teams. Demographic and macroeconomic trends indicate that demand for anesthesia services will continue to rise [23]. Anesthesiology, resuscitation, and intensive-care departments also operate in therapeutic hospitals, and their performance is linked to patient outcomes, hospital mortality, disability, temporary loss of working capacity, and healthcare costs.

One of the key factors influencing the work of hospital structural units is the increasing proportion of patients in severe condition and the share of emergency hospitalizations [24]. This increases the number of patients requiring emergency care and intensive therapy and strengthens the role of the anesthesiology and resuscitation service [25]. Reducing mortality in resuscitation units is an important reserve for reducing overall hospital mortality [26].

Kazakhstan context and workforce capacity

Kazakhstan's healthcare system is undergoing changes affecting both outpatient and inpatient care [27]. One direction has been the redistribution of bed capacity according to the intensity of treatment and care [28]. Such changes require review of the functional purpose and structure of hospitals and adaptation of their work to new conditions. This is particularly relevant for urban hospitals, where severely ill patients often require emergency care and intensive treatment. Anesthesiology and resuscitation departments play a critical role in these hospitals, and the volume of their work may increase in

accordance with new organizational requirements [29].

Comparative analyses have identified differences in anesthesiology and intensive-care systems in Kazakhstan and abroad, including the level of training and experience of medical personnel. A global shortage of healthcare workers may exacerbate internal workforce imbalances, while rural areas often experience greater difficulties in attracting qualified personnel. International estimates underscore the scale of workforce shortages worldwide [30]. Kazakhstan workforce statistics for 2022 provide a basis for examining national staffing levels and regional distribution of specialists [29]. The precise number of anesthesiologists-resuscitators requires confirmation against the relevant table of the official statistical collection.

The available source material does not provide sufficient methodological information to substantiate a specific percentage of errors among deceased patients; consequently, this estimate is not used as evidence in the present review.

Kazakhstan has taken steps to develop anesthesiology and resuscitation through structural and quality-improvement measures. The Ministry of Health approved the Standard for the Organization of Anesthesiological and Resuscitation Care in the Republic of Kazakhstan by Order No. 78 of April 26, 2023 (registered No. 32409), subsequently amended, including amendments dated December 18, 2025 [33]. Professional education and resuscitation training should be discussed separately from the legal basis of this standard [21, 24].

Key criteria for assessing anesthesiological care

Quality of anesthesia and patient safety. One of the most important assessment dimensions is the prevention and reduction of postoperative complications, including pain, allergic reactions, and respiratory problems. The effectiveness of pain relief and reduction of complication risks depend on the anesthesiologist's qualifications and the anesthesia methods used [1, 18, 31].

Medical facility equipment. The availability of modern anesthesia equipment, real-time patient monitoring, and emergency resuscitation devices is essential for safe care. Equipment should be functional, adequately maintained, and consistent with contemporary clinical requirements [31, 33].

Professionalism of anesthesiologists. Professional competence includes the ability to assess the patient's condition, select an appropriate anesthesia strategy, anticipate risks, and respond to complications. Continuous professional development and regular training are necessary to maintain a high level of service [24, 31].

Adherence to standards and protocols. An important component of quality assessment is compliance with established standards and protocols during anesthesia and the postoperative period, with particular attention to prevention of complications and maintenance of a stable patient condition [1, 21, 31, 33].

Discussion

The reviewed evidence supports a systems perspective on anesthesiological care. Improvements in safety over recent decades have occurred alongside advances in specialist training, technology, pharmacotherapy, monitoring, standardization, and professional attention to patient safety. At the same time, growing numbers of older and high-risk patients and the increasing share of emergency care create additional demand for anesthesiology and intensive-care services.

For Kazakhstan, the key organizational issue is not only the absolute number of specialists but also their distribution, professional development, technical support, and integration into standardized clinical processes. National regulation and certification initiatives create a basis for further improvement, but meaningful assessment requires comparable indicators of staffing, equipment readiness, protocol adherence, adverse events, intensive-care outcomes, and regional accessibility.

The criteria described in the source material—patient safety, technical equipment, professional competence, and adherence to standards—can therefore be considered complementary dimensions of service quality rather than isolated characteristics. Their combined assessment may provide a more

informative picture of the capacity of anesthesiology and resuscitation services.

Practical significance

For healthcare organizations, the review supports the use of a structured assessment framework that combines staffing ratios and qualification levels, availability and maintenance of anesthesia and monitoring equipment, compliance with protocols, regular clinical audit, continuing professional education, and monitoring of adverse events and outcomes. At the system level, regional comparison of these indicators may help identify areas with limited access and support more targeted workforce and infrastructure planning.

Limitations

The review is narrative and is based on sources that differ substantially in year of publication, population, healthcare setting, and study design. The original manuscript does not provide a reproducible search strategy or formal quality appraisal, and several numerical estimates refer to different countries or historical periods and therefore cannot be interpreted as directly representative of the current situation in Kazakhstan. A previously reported percentage of errors among deceased patients lacks sufficient methodological documentation to permit interpretation and has therefore been excluded from the substantive synthesis. These limitations restrict quantitative comparisons and causal interpretation.

Future research

Further research in Kazakhstan should use contemporary multicenter data to assess anesthesiology and intensive-care services by region and type of medical organization. Prospective audits should evaluate staffing and workload, equipment readiness, adherence to anesthesia and resuscitation protocols, adverse-event reporting, postoperative complications, intensive-care mortality, and patient-centered outcomes. Development of standardized national indicators would allow repeated monitoring and support evidence-based planning of anesthesiology services.

Conclusion

With the development of anesthesiology and resuscitation, requirements for the quality and safety of medical care have increased substantially. Patient safety remains relevant not only to anesthesiology but to all levels of medical care. International standards and protocols provide an important basis for further development of anesthesiological services.

Achievements in anesthesiology and resuscitation have contributed to a high level of anesthesia safety. Nevertheless, unresolved issues remain, including professional workforce development, regional availability of specialists, modernization and maintenance of medical equipment, standardized clinical processes, and further improvement of patient monitoring. Coordinated development of these components is necessary to strengthen the effectiveness and accessibility of anesthesiological care in Kazakhstan.

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Conflict of interest. The authors declare no conflict of interest.
Funding. The work received no external funding.
Ethical considerations. This article is a narrative review based on published scientific literature and secondary statistical and regulatory materials. No newly recruited participants, biological samples, or individual medical data were used; therefore, separate ethics committee approval and informed consent were not required.
Data availability. All data discussed in the review are derived from the published and official sources cited in the article.
Publication statement. The authors declare that the manuscript has not been previously published and is not under consideration elsewhere.
Author contributions. E.Zh. Nurtayev - Conceptualization; Investigation; Data curation; Writing - original draft. A.A. Aitmanbetova - Methodology; Supervision; Validation; Writing - review & editing.

Мүдделер қақтығысы. Авторлар мүдделер қақтығысының жоқ екенін мәлімдейді.
Қаржыландыру. Жұмыс сыртқы қаржыландырусыз орындалды.
Этикалық аспектілер. Мақала жарияланған ғылыми әдебиеттерге және екіншілік статистикалық және нормативтік материалдарға негізделген нарративтік шолу болып табылады. Жаңадан тартылған зерттеу қатысушылары, биологиялық үлгілер немесе жеке медициналық деректер пайдаланылған жоқ; сондықтан этикалық комитеттің жеке мақұлдауы және ақпараттандырылған келісім талап етілмеді.
Деректердің қолжетімділігі. Шолуда талданған барлық деректер мақалада көрсетілген жарияланған және ресми дереккөздерден алынған.
Жарияланым туралы мәлімдеме. Авторлар қолжазбаның бұрын жарияланбағанын және басқа басылымда қаралып жатпағанын мәлімдейді.
Авторлардың үлесі. Нуртаев Е.Ж. - Conceptualization; Investigation; Data curation; Writing – original draft. Айтманбетова А.А. - Methodology; Supervision; Validation; Writing - review & editing.

Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.
Финансирование. Работа выполнена без внешнего финансирования.
Этические аспекты. Статья представляет собой нарративный обзор опубликованной научной литературы и вторичных статистических и нормативных материалов. Новые участники исследования, биологические образцы и индивидуальные медицинские данные не использовались; поэтому отдельное одобрение этического комитета и получение информированного согласия не требовались.
Доступность данных. Все данные, обсуждаемые в обзоре, получены из опубликованных и официальных источников, приведенных в статье.
Заявление о публикации. Авторы заявляют, что рукопись ранее не публиковалась и не находится на рассмотрении в другом издании.
Вклад авторов. Нуртаев Е.Ж. - Conceptualization; Investigation; Data curation; Writing - original draft. Айтманбетова А.А. - Methodology; Supervision; Validation; Writing - review & editing.

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