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N.N. Yelansky's Contribution to Military Medicine (on the 130th Anniversary of His Birth)

Sergey Ya. Ivanusa, David K. Dzhachvadze, Mariia V. Babenko, Boris V. Risman

Kirov Military Medical Academy, Saint Petersburg, Russia

ABSTRACT

May 3, 2024, marks the 130th birth anniversary of Nikolai N. Yelansky (1894–2024), a well-known Russian transfusiologist and internationally renowned surgeon, professor, and lieutenant general of medical service. Yelansky is known for his contributions in military field surgery, particularly in the treatment of gunshot wounds to soft tissues, the chest, and long bones and traumatic shock. However, his achievements in experimental physiology, transfusiology, and blood donation remain underappreciated. Although Yelansky's focus was clinical practice, his commitment to Pavlov's physiological doctrine left a distinct mark on his scientific works. Over his career, Yelansky published 146 scientific articles on clinical surgery issues. Under his supervision, 9 doctoral and over 30 candidate dissertations were defended. By instilling his students' autonomy, initiativeness, professional dedication, and self-sacrifice, he took joy in their successes. Yelansky's students included outstanding figures in medicine such as Academician M.I. Kuzin and Professors O.S. Shkrob, E.I. Zakharov, L.V. Uspensky, A.A. Begelman, M.A. Chistova, V.S. Pomelov, V.G. Ryabtsov, N.M. Yanchur, M.M. Dykhno, and A.A. Kazansky. His gift for scientific foresight is reflected in his research, which often directed Russian surgical development. In the viewpoint of his student Kuzin, this was attributable to the exceptional character of Yelansky—his tremendous industriousness, modesty, and profound humanity. The formation of his worldview, including his scientific outlook and the diversity of his professional endeavors, stemmed from his childhood and adolescence and from the sociopolitical structure and economic foundations of the state at the time. Yelansky's contributions to his homeland were marked by numerous honorary titles, government decorations, and awards. These include Hero of Socialist Labor (1964); three Orders of Lenin (1946, 1954, and 1964); four Orders of the Red Banner (1942, 1944, 1945, and 1951); the Order of Alexander Nevsky (1945); the Order of the Patriotic War, 1st class (1943); two Orders of the Red Star (1939 and 1940); and "For the Capture of Budapest," "For the Capture of Vienna," "For the Victory over Germany in the Great Patriotic War of 1941–1945," and "For the Victory over Japan" medals.

Keywords: N.N. Yelansky; history of surgery; Department of General Surgery; transfusiology; military field surgery; military medicine; gunshot wounds; traumatic shock.

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Вклад Н.Н. Еланского в военную медицину (к 130-летию со дня рождения)

С.Я. Ивануса, Д.К. Джачвадзе, М.В. Бабенко, Б.В. Рисман

Военно-медицинская академия им. С.М. Кирова, Санкт-Петербург, Россия

АННОТАЦИЯ

3 мая 2024 г. исполнилось бы 130 лет со дня рождения отечественного трансфузиолога и хирурга с мировым именем, профессора, генерала-лейтенанта медицинской службы — Николая Николаевича Еланского (1894–2024). В основном с именем Еланского связаны такие работы в области военно-полевой хирургии, как проблемы лечения огнестрельных ран мягких тканей, огнестрельных ранений грудной клетки, трубчатых костей, травматического шока. В связи с этим вклад великого деятеля науки в области экспериментально-физиологического направления, трансфузиологии и донорства далеко недооценен. Хотя ведущей была клиническая деятельность, а также приверженность к физиологическому учению И.П. Павлова, которые оставили свой отпечаток во всех работах Н.Н. Еланского. Всего за годы работы Н.Н. Еланским опубликовано 146 научных работ по различным проблемам клинической хирургии. Под его руководством выполнено и защищено 9 докторских и свыше 30 кандидатских диссертаций. Воспитывая в своих последователях самостоятельность, инициативность, любовь и самопожертвование в профессии, он радовался их достижениям. Учениками Н.Н. Еланского были такие выдающиеся деятели медицины, как академик М.И. Кузин, профессора О.С. Шкроб, Е.И. Захаров, Л.В. Успенский, А.А. Бегельман, М.А. Чистова, В.С. Помелов, В.Г. Рябцов, Н.М. Янчур, М.М. Дыхно, А.А. Казанский. Еланский обладал даром научного предвидения, это отражено в его работах, которые опережали пути развития российской хирургии. По мнению его ученика М.И. Кузина, причина этого — в незаурядности самой личности Н.Н. Еланского, его огромном трудолюбии, скромности и человечности. Формирование мировоззрения, в том числе и научного, а также его разносторонняя деятельность берет начало не только с детства и отрочества, но и общественно-политического строя, экономической основы государства того времени. Заслуги Н.Н. Еланского перед Родиной отмечены многими почетными званиями, правительственными наградами и премиями. Среди них Герой Социалистического Труда (1964); кавалер трех орденов Ленина (1946, 1954, 1964); четырех орденов Красного Знамени (1942, 1944, 1945, 1951); ордена Александра Невского (1945); ордена Отечественной войны I степени (1943); двух орденов Красной Звезды (1939, 1940); медалей «За взятие Будапешта», «За взятие Вены», «За победу над Германией в Великой Отечественной войне 1941–1945 гг.», «За победу над Японией».

Ключевые слова: Н.Н. Еланский; история хирургии; кафедра общей хирургии; трансфузиология; военно-полевая хирургия; военная медицина; огнестрельные раны; травматический шок.

Как цитировать

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Nikolai N. Yelansky was born on May 3, 1894, in Novokhopersk, Voronezh Region, to the family of an office clerk. When he was 8, his father fell ill and died. This tragedy seared into his memory and influenced Yelansky's decision to become a doctor.

In 1913, Yelansky graduated with honors from the Borisoglebsk (Alexander II) Gymnasium; he submitted an application to the Imperial Academy of Medical Surgery and was admitted by enrollment competition of certificates. Owing to World War I, which began in the summer of 1914, the training of future doctors was amended as they were repeatedly seconded to military training and internships. Young Yelansky attended the camp of the 113th Infantry Starorussky Regiment (Liepaja, 1914), underwent a hospital training course (1915), and was an acting physician at the 327th Combat Support Hospital (1916).

After the 1917 Revolution, Yelansky obtained a doctor's degree with honors from the Military Medical Academy (Fig. 1); in the summer of the same year, he headed off to war as a hospital train dispatcher of the 65th Hospital Station (Ternopil).

After the evacuation of approximately 1000 wounded from the advancing German and Austrian troops, Yelansky was appointed Junior Doctor of the Proskurovsky Border Regiment. Furthermore, he had to serve as the senior regimental doctor.

After the Romanian troops advanced to Bessarabia and Yelansky's regiment retreated beyond the Dniester, it was disbanded. In 1918, Yelansky returned to the Voronezh Region, where he worked as a neighborhood doctor in a rural hospital. In 1920, he worked as a part-time doctor at the Central District Hospital of Novokhopyorsk.

However, an irresistible thirst for knowledge and desire for excellence again brought Yelansky to the Medical Surgery Academy. In 1921, he was employed as a university doctor and then as an associate doctor in Professor Sergey P. Fedorov's teaching hospital, where Yelansky worked for 15 years (Fig. 2).

Owing to his exceptional work capacity and extraordinary research talent, Yelansky conducted several major studies during his first years at the hospital. Ivan Pavlov's physiological and functional studies of the stomach and duodenum had been the only ones on this subject for many years. Completed at the same time, *An Attempt to Describe Immediate and Long-Term Outcomes of Gastric and Duodenal Ulcer Surgeries*, where Yelansky was one of the first to show the therapeutic benefits of gastroenterostomy, was of great interest.

In 1924, Yelansky defended his doctoral thesis *On the Relationship Between Gastric Ulcer and Gastric Cancer*. This was the first fundamental Russian study, which laid the basis of the theory of precancerous stomach conditions.

Fig. 1. Nikolai Yelansky after graduating from the Military Medical Academy, 1917. © Courtesy of the Borisoglebsk Historical and Art Museum. State catalogue no. 41514681, 2025.

Fig. 2. Nikolai Yelansky with the Fyodorov Teaching Hospital personnel, 1930–1934. © Courtesy of the Military Medical Museum. State catalogue no. 53928411, 2025.

The study on blood transfusion was significant among his studies. *Isohemagglutinating Capacity of Human Blood, Its Significance for Surgeons and Methods of Determination* was published by Yelansky in collaboration with Vladimir N. Shamov in 1923 in *New Archives of Surgery*.

Obtaining serums for determining blood types was a major achievement in the history of the Russian transfusion science; thereafter, blood transfusions were performed only in a scientific way. For several years, Yelansky made standard serums to determine blood types and delivered them to various cities and towns of the country [1]. Later, Gemotest laboratory was established at Professor Fedorov's teaching hospital, which supplied serums to all municipal hospitals.

At the 22nd All-Union Congress of Surgeons, Yelansky presented *On Training of Blood Transfusion Personnel: Blood Transfusion at Various Stages of Evacuation*. Shortly after, his article *General Principles of Stopping the Bleeding: Shock,*

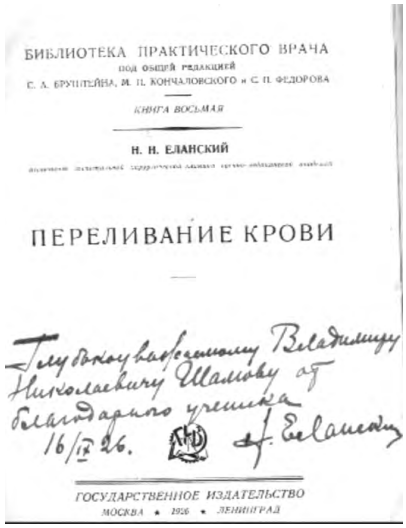
БИБЛИОТЕКА ПРАКТИЧЕСКОГО ВРАЧА
под общей редакцией
С. А. БРУШТЕЙНА, М. П. КОНЧАЛОВСКОГО и С. П. ФЕДОРОВА
КНИГА ВОСЬМАЯ
Н. Н. ЕЛАНСКИЙ
ПЕРЕЛИВАНИЕ КРОВИ
ГОСУДАРСТВЕННОЕ ИЗДАТЕЛЬСТВО
МОСКВА ★ 1926 ★ ЛЕНИНГРАД

Fig. 3. Title page of Yelansky's monograph Blood Transfusion with an inscription for Vladimir N. Shamov, 1926. © Courtesy of the Military Medical Museum, 2025.

Fig. 4. Nikolai Yelansky, a Military Medical Academy professor, 1938. © Courtesy of the Borisoglebsk Historical and Art Museum. State catalogue no. 415146801938, 2025.

Fig. 5. Nikolai Yelansky with fellow soldiers at Khalkhin Gol, 1939. © Courtesy of the Novgorod State United Memorial estate. State catalogue no. 5531254, 2025.

Blood Loss, and Methods to Control Them. Blood Transfusion was published. In 1926, he published the monograph *Blood Transfusion*—the first fundamental guide and manual on blood transfusion in the USSR [2, 3] (Fig. 3).

Yelansky promoted voluntary blood donation and formed blood donor groups in the troops and hospitals. Although the need for practical application of blood was undisputed, the elaboration of the blood transfusion theory diverged; some, led by Yelansky, promoted direct blood transfusion during military operations, whereas others advocated for transfusion of preserved blood.

Subsequently, Yelansky acknowledged his erroneous views, "In 1928, I wrote that transfusion of preserved blood could not be widely used in war setting; however, the works of Soviet authors over the past period have forced me to change my opinion and make completely opposite conclusions" [4].

In 1929, Yelansky published *Blood Transfusion in War Setting* in the *New Archives of Surgery* [5]. Through his enterprise, all Red Army soldiers, including commanders, had their blood types determined and indicated in their Red Army personnel IDs. In May 1923, Yelansky raised a point of the need to create and train a Blood Service during military operations. Retrainer courses on blood transfusion were organized for reserve military personnel and doctors. In the same year, Yelansky experimentally concluded the efficacy of blood transfusion in the treatment of poisoning by asphyxiating gases [6].

In 1934, Yelansky was elected Head of the Theoretical Surgery Department at the Leningrad Pediatric Institute, where he combined his employment with work at S.P. Fedorov's hospital. In 1937, Yelansky was appointed Head of the General Surgery Department at the Kirov Military Medical Academy. However, in early 1938, he was entrusted with the position Head of the Battlefield Surgery Department at the Academy (Fig. 4).

In 1939, Yelansky participated in military operations on the Khalkhin Gol River and Lake Khasan as the head of a surgical detached unit (Fig. 5).

He continued this service during the Soviet–Finnish War of 1939–1940, when he and his assistants (26 faculty members, 19 medical officers, and 14 students) set up a mobile hospital, where they operated on 70% of the admitted wounded in combat conditions (Fig. 6). Professor Shamov, who was then the Head of the Leningrad Blood Transfusion Institute, managed the well-coordinated operations of the hospital's blood transfusion service [7].

In the hospital, Yelansky was the first to establish shock wards, where they treated acute blood loss and shock without presurgery procedures. He focused on document management of the forward area to introduce transition in the treatment of the wounded.

Fig. 6. Nikolai Yelansky with fellow soldiers at the Soviet–Finnish War, 1939. © Courtesy of the Novgorod State United Memorial estate. State catalogue no. 5531284, 2025.

At the time, the surgery experience allowed to develop clear recommendations on the primary surgical treatment of gunshot wounds; manuals on surgical care of the wounded were revised, and their main provision was prohibiting blind sutures on gunshot wounds.

Yelansky summarized his extensive scientific experience and best practices in a manual for medical officers, *Battle Field Surgery* (Fig. 7), which was published in 1941, on the eve of the Great Patriotic War.

In the following decade, this manual had four reeditions. For the 5th edition published based on the Great Patriotic War experience [8], Yelansky was awarded the Stalin Prize on March 12, 1952. In the post-war years, *Battle Field Surgery* was translated into Polish, Czech, Chinese, Korean, and German (Fig. 8).

During the hard years of the Great Patriotic War, Yelansky fully demonstrated his talent as a leading surgeon. In the first days of the war, he was appointed Chief Surgeon of the Volkhov Front and then the Northwestern, 2nd Belorussian, 2nd Ukrainian, and, finally, the Transbaikal Front. In 1943, he was promoted to Major General of the Medical Service (Fig. 9).

A blood transfusion system was created on the Northwestern Front and was rolled out and extended to other fronts. In 1942, blood transfusions for the wounded in the medical battalions of the Northwestern Front accounted for approximately 8% of all those admitted to hospitals [9]. Later, Yelansky was the first to excellently establish army and front-line blood transfusion stations.

When Vladimir Shamov arrived at the 2nd Ukrainian Front in 1944, he was amazed by the organized and efficient provision of preserved blood to medical units at the front line. He wrote, "I knew that Nikolai [Yelansky] was a great enthusiast of blood transfusion, but accomplish such a thing in a war… I am speechless" [10].

During this challenging period for the country, Yelansky did not stop his research efforts. In 1942–1943 alone,

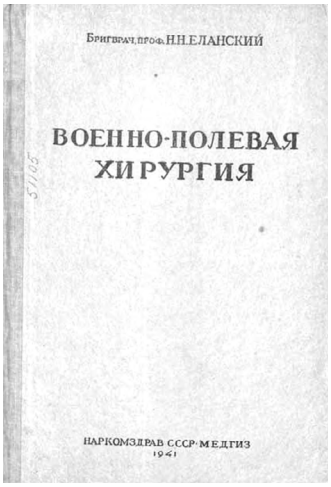

Fig. 7. Cover of the manual on battlefield surgery for medical officers by Yelansky, 1st edition, 1941. © Courtesy of the Russian Museum of Medicine of the Semashko National Research Institute of Public Health. State catalogue no. 44047120, 2025.

Fig. 8. German edition cover of the manual for medical officers by Yelansky, Grundlagen der feldchirurgie, 1958. © Courtesy of the Russian Museum of Medicine of the Semashko National Research Institute of Public Health. State catalogue no. 26106822, 2025.

Fig. 9. Major General of the Medical Service Nikolai Yelansky, 1943. © Courtesy of the Military Medical Museum. State catalogue no. 40314977, 2025.

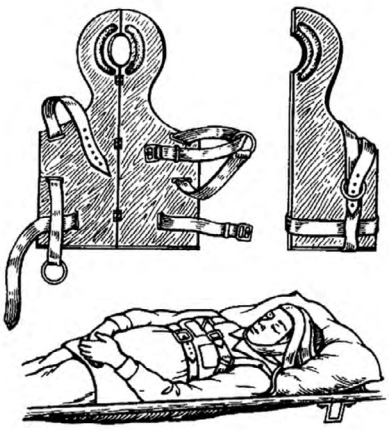

Fig. 10. Yelansky's Plywood Splint for transporting wounded individuals with traumatic brain injury. © Courtesy of osteocure.ru, 2025.

16 scientific conferences and over 10 meetings of the front, army, and divisional institution commanders were held in the Northwestern Front. Three collections of scientific articles, over 200 scientific papers of front-line surgeons, and 7 journals were published [11]. In 1942, Yelansky was awarded the title Honored Scientist, and in 1944, he was promoted to Lieutenant General of the Medical Service.

Yelansky was an advocate of active treatment of gunshot wounds. During the Great Patriotic War, he was one of the first to develop indications for a primary delayed suture; he provided scientific arguments and proved the advantage of early application of a secondary suture.

The Great Patriotic War demonstrated the inadequacy of previous guidelines on surgical care for traumatic brain gunshot wounds. Yelansky updated the definition, concept, and method of primary surgical treatment of traumatic brain wounds (1943) and revealed the need to move specialized neurosurgical care facilities closer to the combat front lines.

Highly efficient specialized neurosurgical hospitals were built in all fronts. Articles on this topic written during the Great Patriotic War and post-war period are of great practical importance; they have become a valuable contribution to battlefield neurosurgery [7].

Yelansky worked tirelessly into the development of surgical treatment of gunshot fractures of tubular bones. Based on his vast experience of the Great Patriotic War, he provided recommendations on special management of fractures of the limb bones at the medical stages of evacuation [7]. Additionally, he created a unique splint for transporting the wounded with traumatic brain injury. Yelansky's splint has been an indispensable transport immobilization tool for a long time (Fig. 10).

When the Great Patriotic War ended, Yelansky returned to the Military Medical Academy. On January 1, 1946, he again headed the General Surgery Department, where he expanded his scientific, teaching, and organizational efforts. The majority of the curriculum topics included the experience of Soviet medicine during the Great Patriotic War. The lectures included topics of blood transfusion, nonpenetrating body injuries, and acute surgical infection. Workshops comprised the skeletal and splint-supported elongation techniques, application of complex plaster bandages, and remedial gymnastics [12].

To sum up his experience on medical service in the past war, Yelansky edited the largest section *Gunshot Wounds and Limb Injuries* of the multi-volume work *Experience of Soviet Medicine in the Great Patriotic War in 1941–1945* [13].

In the summer of 1947, Yelansky was appointed Chief Surgeon of the Soviet Army and elected Head of the Department of the Teaching Surgery Hospital of the I.M. Sechenov First Moscow Medical Institute on a competitive basis. He moved to Moscow and remained the head of this department until his last days. Yelansky was appointed Chairman of the State Commission for Academic Degrees and Titles in Moscow. In March 1948, he became a member of the commission under the Presidium of the USSR Academy of Medical Sciences (Fig. 11).

When he was sent to Ashgabat after the 1948 earthquake, Yelansky supervised the entire medical care system for the affected population. The injured population included people who had been under the buildings debris for a long time. The people had no serious external injuries; however, many of them eventually died from kidney failure. In 1950, Yelansky described the clinical scenario of this syndrome and his original interpretation, naming this condition traumatic toxicosis. He was one of the first in the Soviet Union to use hemodialysis in his hospital to treat acute renal failure in crush syndrome [9].

The Artificial Kidney Department eventually became the Critical Condition Department, which treated the most

severe surgical conditions, including sepsis and peritonitis with acute renal failure. This department trained professionals for centers for patients with acute renal failure.

Yelansky had always been interested in the issues of physiology in surgery. He proposed an original cortico-organ theory of the pathogenesis of obliterative endarteritis (1950) and its treatment method, which soon became widespread. At the 25th All-Union Congress of Surgeons, together with Boris Petrovsky and Alexander Vishnevsky, Yelansky presented *Physiological Foundations of Contemporary Surgery*, which showed the development trends of contemporary surgery. The same issues were addressed in the speech *Pavlov Physiology Doctrine in Surgery*, which was delivered at the ceremonial annual meeting of the First Moscow Medical Institute on October 11, 1952.

In May 1954, Professor Yelansky was awarded his second Order of Lenin, the highest state award in the USSR (Fig. 12).

Another area of Yelansky's interest was surgical oncology. With experience in treating the wounded with thoracic injuries, he was one of the first in the USSR to operate on lung and esophagus cancers. At the departments he headed in the 1950s and 1960s, Yelansky was busy with improving surgical approaches to the esophagus, resections and reconstructions of the esophagus affected by cancer, gastrectomy and restoration of gastrointestinal continuity, and liver and biliary tract surgery (Fig. 13).

During the same years, Professor Yelansky participated in international medical and surgical conferences. He welcomed members of a Belgian delegation at his hospital and visited Czechoslovakia and India (Fig. 14).

Under Yelansky's supervision (Fig. 15), novel treatment methods were deployed, and the basic principles of antibiotic therapy were elaborated, such as clear indications for use and use of bacteria-specific drugs; possible antibiotic prophylaxis during surgery was studied to minimize intraoperative complications and improve the outcome; and the requirement for local administration of antibiotics at the site of inflammation or the injury was promoted.

Fig. 11. Lieutenant General of the Medical Service Nikolai Yelansky in dress uniforms with decorations. © Courtesy of the Military Medical Museum. State catalogue no. 11563188, 2025.

Yelansky designed a set of metal nails (spokes) that were used to correctly align and fix bone fragments and constantly irrigate the injured area with penicillin (Fig. 16).

Over his career, Yelansky (Fig. 17) published 146 research articles on various matters of clinical surgery. He trained 9 Doctors and over 30 Candidates of Sciences in Medicine [14].

Yelansky was a Doctor of Sciences in Medicine (1924); Professor (1932); Honored Scientist of the Russian Soviet Federative Socialist Republic (1942); laureate of the Third Class Stalin Prize (1952) for the 5th edition of the manual *Battle Field Surgery* for medical officers; Honorary Member of the All-Russian Scientific Society of Surgeons, International Association of Surgeons (India), and Czechoslovakia's Society of Surgery; Vice President of the Soviet–Belgian Friendship Society; member of the editorial board of *Military Medical Journal*, *Surgery*, and *Soviet Medical Journal*; and deputy of the Frunzensky District of Moscow [15].

Fig. 12. Kliment Voroshilov awards the Order of Lenin to Nikolai Yelansky, 1954. © Courtesy of the Borisoglebsk History and Arts Museum. State catalogue no. 40039608, 2025.

Fig. 13. Professor Yelansky operates at the 1st Medical Institute, 1956. © Courtesy of the Museum of Moscow. State catalogue no. 46523666, 2025.

Fig. 14. Nikolai Yelansky and Boris Petrov with Hindu doctors during a surgical congress, Hyderabad (India), 1955. © Courtesy of the Military Medical Museum. State catalogue no. 53928503, 2025.

Fig. 15. Professor Yelansky, Head of the Department of the I.M. Sechenov First Moscow Medical Institute, 1960s. © Courtesy of the Museum of Moscow. Exhibits are courtesy of the historian of medicine Mikhail Kuzmin. State catalogue no. 42701010, 2025.

The contributions of this great figure in science and medicine were duly appreciated on April 30, 1964; he was awarded Hero of Socialist Labor by the Decree of the Presidium of the Supreme Soviet of the USSR. In the same year, his textbook *Surgical Diseases* for medical institutes was published. It contained sections on specialty surgery and addressed issues on diagnosis and treatment of common surgical diseases with a contemporary approach. Each section provides historical information. The textbook addresses the issues of etiology, pathogenesis, diagnosis, and treatment of common surgical conditions and general surgery matters required for understanding the course of surgical conditions [16].

Yelansky's services to his homeland were recognized with many honorary titles, government awards, and prizes, including Hero of Socialist Labor (1964); three Orders of Lenin (1946, 1954, and 1964); four Orders of the Red Banner

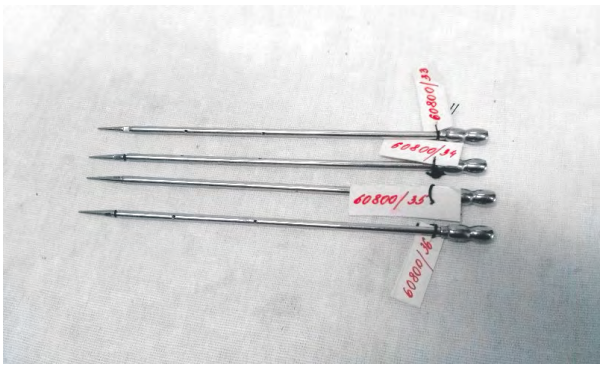

Fig. 16. Nails (spokes) from the set N.N. Yelansky. © Courtesy of the Military Medical Museum. State catalogue no 11839810, 2025 г.

Fig. 17. Nikolai Yelansky, Lieutenant General of the Medical Service, in his office, 1962. © Courtesy of the Military Medical Museum. State catalogue no. 11563226, 2025.

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Fig. 18. Grave of the Hero of Socialist Labor Nikolai Yelansky. Novodevichy Cemetery, Moscow. © S.Ya. Ivanusa et al., 2025.

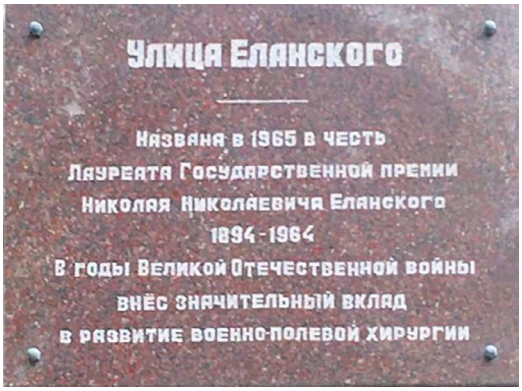

Fig. 19. The memorial plaque on 2 Yelansky Str., bld. 1, Moscow. © S.Ya. Ivanusa et al., 2025.

(1942, 1944, 1945, and 1951); the Order of Alexander Nevsky (1945); the 1st Class Order of the Patriotic War (1943); two Orders of the Red Star (1939 and 1940); and medals for the Capture of Budapest, Capture of Vienna, Victory over Germany in the Great Patriotic War of 1941–1945, and Victory over Japan [14].

Yelansky died on August 31, 1964, at age 70, just 4 months after being awarded Hero of Socialist Labor. He was buried in Moscow at the Novodevichy Cemetery, section 6, row 10, grave 1 (Fig. 18).

In 1965, a street in Khamovniki District between 2nd Truzhenikov Lane and Bolshaya Pirogovskaya Street in Moscow was named after Yelansky. In this street, building no. 2/1 (Fig. 19) has a memorial plaque installed in his honor.

As Yelansky's apprentice Mikhail Kuzin recalls [17], Yelansky was a man of great diligence, modesty, and humanity. These traits, together with his inherent researcher's gift of scientific foresight and extraordinary personality, allowed Yelansky to be at the forefront of the development of Soviet battlefield surgery and be remembered by his students and followers even now, 130 years after his birth.

ADDITIONAL INFORMATION

Authors' contribution. *S.Ya. Ivanusa*: general concept development, data analysis; *D.K. Dzhachvadze*: research design, writing an article; *M.V. Babenko*: data collection, writing an article; *B.V. Risman*: data analysis. The authors have approved the version for publication and have also agreed to be responsible for all aspects of the work, ensuring that issues relating to the accuracy and integrity of any part of it are properly considered and addressed.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. С.Я. Ивануса — разработка общей концепции, анализ данных; Д.К. Джачвадзе — дизайн исследования, написание статьи; М.В. Бабенко — сбор данных, написание статьи; Б.В. Рисман — анализ данных. Авторы одобрили версию для публикации, а также согласились нести ответственность за все аспекты работы, гарантируя надлежащее рассмотрение и решение вопросов, связанных с точностью и добросовестностью любой ее части.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Раскрытие интересов. Авторы заявляют об отсутствии отношений, деятельности и интересов за последние три года, связанных с третьими лицами (коммерческими и некоммерческими), интересы которых могут быть затронуты содержанием статьи.

Оригинальность. При создании настоящей работы авторы не использовали ранее опубликованные сведения (текст, иллюстрации, данные).

Доступ к данным. Все данные, полученные в настоящем исследовании, доступны в статье.

Генеративный искусственный интеллект. При создании настоящей статьи технологии генеративного искусственного интеллекта не использовали.

Рассмотрение и рецензирование. Настоящая работа подана в журнал в инициативном порядке и рассмотрена по обычной процедуре. В рецензировании участвовали два внутренних рецензента.

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AUTORS INFO

***Mariia V. Babenko,** MD, Cand. Sci. (Medicine);
address: 6Zh, Akademika Lebedeva st., Saint Petersburg, 194044, Russia; ORCID: 0009-0000-1128-1096; eLibrary SPIN: 4150-0610; e-mail: vmeda-nio@mil.ru

Sergey Ya. Ivanusa, MD, Dr. Sci. (Medicine), Professor;
ORCID: 0000-0003-3948-6928; eLibrary SPIN: 8752-1600

David K. Dzhachvadze, MD, Cand. Sci. (Medicine);
ORCID: 0000-0002-8494-6420; eLibrary SPIN: 9365-8722

Boris V. Risman, MD, Dr. Sci. (Medicine), Associate Professor;
ORCID: 0000-0002-6634-4450; eLibrary SPIN: 8022-6313

ОБ АВТОРАХ

***Бабенко Мария Викторовна,** канд. мед. наук;
адрес: Россия, 194044, Санкт-Петербург, ул. Академика Лебедева, д. 6Ж; ORCID: 0009-0000-1128-1096;
eLibrary SPIN: 4150-0610; e-mail: vmeda-nio@mil.ru

Ивануса Сергей Ярославович, д-р мед. наук, профессор;
ORCID: 0000-0003-3948-6928; eLibrary SPIN: 8752-1600

Джачвадзе Давид Какоевич, канд. мед. наук;
ORCID: 0000-0002-8494-6420; eLibrary SPIN: 9365-8722

Рисман Борис Вениаминович, д-р мед. наук, доцент;
ORCID: 0000-0002-6634-4450; eLibrary SPIN: 8022-6313

* Corresponding author / Автор, ответственный за переписку