

# GEORGIAN MEDICAL NEWS

---

ISSN 1512-0112

№ 12 (369) Декабрь 2025

---

ТБИЛИСИ - NEW YORK



ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии  
საქართველოს სამედიცინო სიახლეები

## GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press. Published since 1994. Distributed in NIS, EU and USA.

**GMN: Georgian Medical News** is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

**GMN: Медицинские новости Грузии** - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

**GMN: Georgian Medical News** – საქართველოს სამედიცინო ხიახლები – არის უფლებული სამეცნიერო სამედიცინო რევიუზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეცნიელების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რეცენზირდება ინგლისურ ენებზე ქვეყნება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

## WEBSITE

[www.geomednews.com](http://www.geomednews.com)

## К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применяющиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи.** Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и [http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html) В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

**При нарушении указанных правил статьи не рассматриваются.**

## REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.
2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.
3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: [http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html)  
[http://www.icmje.org/urm\\_full.pdf](http://www.icmje.org/urm_full.pdf)

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.**

## ავტორია საშურალებოდ!

რედაქტორი სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე, დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურნოვან ტექსტებში - **Times New Roman (Кириллицა)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სის და რეზიუმების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გამუქდება: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანორმილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოსასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტ-სურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ურნალის დასახელება, გამოცემის ადგილი, წელი, ურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფრჩილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცეპტია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქტორი იტოვებს უფლებას შეასწოროს სტატიას. ტექსტშე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქტორი ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდიდად წარდგენილი იყო სხვა რედაქტორიაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

Содержание:

Yuliya Tyravtska, Dmytro Maltsev, Valentyna Moyseyenko, Vitalii Reshetyo, Volodymyr Yakymenko.	
IMMUNOMODULATORS IN THE TREATMENT OF ATHEROSCLEROSIS AND OTHER CHRONIC HEART DISEASES: PROSPECTS ANDRISKS.....	6-16
Aldabekova G, Khamidullina Z, Abdrashidova S, Musina A, Kassymbek S, Kokisheva G, Suleimenova Zh, Sarsenbieva A, Kamalbekova G. ASSESSMENT OF THE IMPLEMENTATION OF WHO INFECTION PREVENTION AND CONTROL (IPC) CORE COMPONENTS IN KAZAKHSTAN: FINDINGS BASED ON THE IPCAF TOOL.....	17-22
Madina Madiyeva, Gulzhan Bersimbekova, Gulnur Kanapiyanova, Mariya Prilutskaya, Aray Mukanova. ANALYSIS OF RISK FACTORS AND THEIR IMPACT ON BONE HEALTH STATUS IN KAZAKH POPULATIONS.....	23-30
Bilanishvili I, Barbakadze M, Nikabadze N, Andronikashvili G, Nanobashvili Z. AUDIOGENIC SEIZURE SUPPRESSION BY VENTRAL TEGMENTAL AREA STIMULATION.....	31-37
Yan Wang, Yulei Xie, Chong Yin, Qing Wu. EXPLORING THE MECHANISM OF ACTION OF HEMP SEEDS (CANNABIS SATIVA L.) IN TREATING OSTEOPOROSIS USING NETWORKPHARMACOLOGY.....	38-43
Marzhan Myrzakhanova, Gulshara Berdesheva, Kulsara Rustemova, Shynar Kulbayeva, Yuriy Lissitsyn, Zhuldyz Tleubergenova. TRANSFORMING MEDICAL EDUCATION IN KAZAKHSTAN: THE POTENTIAL OF VIRTUAL REALITY FOR ENHANCING THE LEARNING EXPERIENCE.....	44-51
Malinochka Arina D, Khupsergenov Emir Z, Avagyan Artyom A, Kurachenko Yulia V, Britan Inna I, Hvorostova Serafima V, Koipish Vladislav S, Siiakina Anastasiia E, Vasileva Vasilisa V, Mikheenko Diana D, Fomenko Danila A. LATE DIAGNOSIS OF ACROMEGALY IN THE SETTING OF A SOMATOPROLACTINOMA.....	52-54
Serhii Lobanov. ONTOGENETIC AND PSYCHOSOCIAL DETERMINANTS OF ADDICTIVE BEHAVIOR FORMATION AMONG UKRAINIAN YOUTH .....	55-62
Emzar Diasamidze, Tamaz Gvenetadze, Giorgi Antadze, Iamze Taboridze, Giorgi Giorgobiani. THE IMPACT OF ANEMIA ON THE DEVELOPMENT OF INCISIONAL HERNIA, PROSPECTIVE STUDY.....	63-67
Karapetyan A.G, Ulusyan T.R, Danielyan M.H, Avetisyan E.A, Petrosyan A.A, Petrosyan S.S, Grigoryan V.S. RESEARCH OF HEMATOLOGICAL CHANGES IN INDIVIDUALS EXPOSED TO IRRADIATION FROM THE CHERNOBYL NUCLEAR POWER PLANT.....	68-71
Yaji Chen, Yin Wang. THE RELATIONSHIP BETWEEN SOCIAL CAPITAL AND WORKERS' MENTAL HEALTH IN CONTEMPORARY CHINA.....	72-78
Begaidarova R.Kh, Alshynbekova G.K, Kadyrova I.A, Alshimbayeva Z.Ye, Nassakayeva G.Ye, Zolotaryova O.A, Omarova G.M. CASE REPORT OF INFLUENZA A (H1N1) PDM 09 STRAIN / KARAGANDA/ 06/2022 IN A CHILD AGED 3 YEARS.....	79-86
Fahad Saleh Ayed AL-Anazi, Albadawi Abdelbagi Talha. ANTIBIOTICGRAM OF URINARY CATHETER-ASSOCIATED BACTERIAL PATHOGENS IN INTENSIVE CARE UNIT, KING KHALID GENERAL HOSPITAL, HAIFER AL-BATEN, SAUDI ARABIA.....	87-95
Serik Baidurin, Ybraim Karim, Akhmetzhanova Shynar, Tkachev Victor, Moldabayeva Altyn, Eshmagambetova Zhanna, Darybayeva Aisha. COEXISTENCE OF APLASTIC ANEMIA AND PAROXYSMAL NOCTURNAL HEMOGLOBINURIA: DIAGNOSTIC CHALLENGES AND THERAPEUTIC STRATEGIES - CASE REPORT.....	96-101
Liika Leshkasheli, Darejan Bolkvadze, Lia Askilashvili, Maria Chichashvili, Megi Khanishvili, Giorgi Tservadze, Nana Balarjishvili, Leila Kvachadze, Elisabed Zaldastanishvili. PHENOTYPIC CHARACTERIZATION OF FIVE PHAGES ACTIVE AGAINST ANTIBIOTIC-RESISTANT <i>KLEBSIELLA PNEUMONIAE</i> .....	102-112
Aliya Manzoorudeen, Marwan Ismail, Ahmed Luay Osman Hashim, Abdelgadir Elamin Eltom. ASSOCIATION BETWEEN GALECTIN-3 AND MICROVASCULAR COMPLICATIONS IN TYPE 2 DIABETES MELLITUS: A COMPARATIVE STUDY.....	113-119
Gulmira Derbissalina, Zhanagul Bekbergenova, Ayagoz Umbetzhanova, Gulsum Mauletbayeva, Gulnara Bedelbayeva. BIOMARKERS OF CARDIOMETABOLIC RISK IN PATIENTS WITH ARTERIAL HYPERTENSION: A CROSS-SECTIONAL PILOT STUDY.....	120-126
Madina Rashova, Saule Akhmetova, Berik Tuleubaev, Dinara Turebekova, Amina Koshanova, Adilet Omenov, Bakdaulet Kambyl, Yekaterina Kossilova. ASSESSMENT OF CLINICAL SYMPTOMS OF ACUTE TOXICITY FOLLOWING THE IMPLANTATION OF A NANOCELLULOSE-BASEDBIOCOMPOSITE.....	127-137
Dali Beridze, Mariam Metreveli, Avtandil Meskhidze, Galina Meparishvili, Aliosha Bakuridze, Malkhaz Jokhadze, Dali Berashvili, Lasha Bakuridze. STUDY OF THE BIOACTIVE COMPOUND COMPOSITION, ANTIMICROBIAL, AND CYTOTOXIC ACTIVITIES OF ENDEMIC PLANT SPECIES OF ADJARA-LAZETI.....	138-152

Faisal Younis Shah, Reece Clough, Fatima Saleh, Mark Poustie, Ioannis Balanos, Ahmed Najjar.	
FACTORS AFFECTING MORTALITY IN PATIENTS WITH HIP FRACTURES AND SHAH HIP FRACTURE MORTALITY SCORE: A RISK QUANTIFICATION TOOL.....	153-159
Anas Ali Alhur, Layan S. Alqahtani, Lojain Al Faraj, Duha Alqahtani, Maram Fahad, Norah Almoneef, Ameerah Balobaied, Rawan Alamri, Aseel Almashal, Fatimah Alkathiri, Lama Alqahtani, Lama Al-Shahrani, Hani Alasmari, Nouran Al Almaie, Sarah Alshehri.	
GLOBAL RESEARCH TRENDS IN MRI SAFETY AND PATIENT AWARENESS: A BIBLIOMETRIC ANALYSIS (2000–2025)...	160-167
Virina Natalia V, Kuchieva Lana M, Baturina Yulia S, Fizikova Aliya B, Gereeva Madina M, Bitiev Batraz F, Apakhaeva Karina K, Manukhova Natalia M, Rasulova Fatima Z, Kornev Egor M, Rodionova Ekaterina A.	
DANIO RERIO (ZEBRAFISH) - A UNIQUE AND INTEGRATIVE PLATFORM FOR 21ST CENTURY BIOMEDICAL RESEARCH.....	168-173
Salah Eldin Omar Hussein, Shamsa Murad Abdalla Murad, Ogail Yousif Dawod, Elryah I Ali, Shawgi A. Elsiddig, Rabab H. Elshaikh A, Awadh S. Alsuhbi, Tagwa Yousif Elsayed Yousif, Siednamohammed Nagat, Amin SI Banaga, Salah Y. Ali, Marwan Ismail, Ayman Hussien Alfeel.	
BIOCHEMICAL ASSOCIATION BETWEEN CALCIUM HOMEOSTASIS AND SERUM URIC ACID LEVELS IN PATIENTS WITH HYPOTHYROIDISM: A COMPARATIVE EVALUATION WITH 25-HYDROXYVITAMIN D.....	174-179
Markova OO, Safonchyk OI, Orlovska IH, Kovalchuk OM, Sukharieva AO, Myrza SS, Keidaluk VO.	
PROTECTION OF CONSUMER RIGHTS IN THE FIELD OF ELECTRONIC COMMERCE OF MEDICINES.....	180-187
Ilona Tserediani, Merab Khvadagian.	
ENDONASAL ENDOSCOPIC DACRYOCYSTORHINOSTOMY USING RADIOFREQUENCY (RF) IN CHRONIC ABSCESSSED DACRYOCYSTITIS: A PROSPECTIVE STUDY.....	188-189
Nadezhda Omelchuk.	
HYPERCORTICISM IN THE PATHOGENESIS OF ACUTE RADIATION SICKNESS AND CONDITIONS OF INCREASED RADIORESISTANCE.....	190-196
Anas Ali Alhur, Raghad Alharajeen, Aliah Alshabanah, Jomanah Alghuwainem, Majed Almukhlifi, Abdullah Al Alshikh, Nasser Alsubaie, Ayat Al Sinan, Raghad Alotaibi, Nadrah Alamri, Atheer Marzouq Alshammari, Nawal Alasmari, Deema Alqurashi, Shahad Alharthi, Renad Alosaimi.	
THE IMPACT OF VISION 2030 ON PHARMACY STUDENTS' CAREER OUTLOOKS AND SPECIALIZATION CHOICES: A CROSS-SECTIONAL ANALYSIS.....	197-203
Fitim Alidema, Arieta Hasani Alidema, Lirim Mustafa, Mirlinde Havolli, Fellenza Abazi.	
LDL-CHOLESTEROL LOWERING WITH ATORVASTATIN, ROSUVASTATIN AND SIMVASTATIN: RESULTS OF A RETROSPECTIVE OBSERVATIONAL STUDY.....	204-209
Ainur Amanzholkyzy, Yersulu Sagidanova, Edgaras Stankevicius, Ainur Donayeva, Ulziya Sarsengali.	
HEAVY METAL TOXICITY VERSUS TRACE ELEMENT PROTECTION IN WOMEN'S REPRODUCTIVE HEALTH - A SYSTEMATIC REVIEW.....	210-216
Marwan Ismail, Mutaz Ibrahim Hassan, Assiya Gherdaoui, Majid Alnaimi, Raghda Altamimi, Srija Manimaran, Mahir Khalil Jallo, Ramprasad Muthukrishnan, Praveen Kumar Kandakurthi, Jaborova Mehroba Salomudinovna, Shukurov Firuz Abdufattoevich, Shawgi A. Elsiddig, Tagwa Yousif Elsayed Yousif, Asaad Babker, Ahmed L. Osman, Abdelgadir Elamin.	
ASSOCIATION BETWEEN EXERCISE MODALITIES AND GLYCEMIC CONTROL IN TYPE 2 DIABETES.....	217-223
Tamar Zarginava, Zaza Sopromadze.	
THE PRIORITY OF CONTEMPORARY MEDICAL UNIVERSITY MODELS IN SUBSTANTIATING BENCHMARKING OF MARKETING SOCIO-ETHICAL STANDARDS.....	224-230
Svetlana Shikanova, Altnay Kabdygaliyeva.	
THE SIGNIFICANCE OF INTERLEUKIN-22 AND HOMOCYSTEINE IN THE PROGNOSIS OF PREMATURE ANTEPARTUM RUPTURE OF MEMBRANES IN PREGNANT WOMEN.....	231-242
Shahad A. Badr, Taqwa B. Thanoon, Zeina A. Althanoon, Marwan M. Merkhan.	
CHARACTERISTICS AND MANAGEMENT OF RESPIRATORY AILMENTS IN PAEDIATRICS: A PROSPECTIVE CLINICAL STUDY .....	243-247
Ulviiya Z. Nabizade, Orkhan Isayev, Gunel R. Haci, Kamal İ. Kazimov, Gulmira H. Nasirova, Rezeda R. Kaziyeva, Elchin H. Guliyev, Isa H. Isayev.	
EVALUATION OF THE DEEP INSPIRATION BREATH-HOLD TECHNIQUE TO IMPROVE DOSIMETRIC OUTCOMES IN RADIOTHERAPY FOR STAGE III NON-SMALL CELL LUNG CANCER.....	248-252
Galina Battalova, Yerkezhan Kalshabay, Zhamilya Zholdybay, Dinara Baigussova, Bolatbek Baimakhanov.	
NON-INVASIVE QUANTITATIVE CT PERfusion OF THE LIVER IN AUTOIMMUNE HEPATITIS.....	253-260
Lachashvili L, Khubua M, Jangavadze M, Bedinasvili Z.	
MiR-29a, miR-222 AND miR-132 IN THE BLOOD PLASMA OF PREGNANT WOMEN AS PREDICTORS OF GESTATIONAL DIABETES.....	261-265
Mohanad Luay Jawhar, Hadzliana Binti Zainal, Sabariah Noor Binti Harun, Baraa Ahmed Saeed.	
OMEGA-3 POLYUNSATURATED FATTY ACIDS AND HYPERTENSION: A REVIEW OF VASOACTIVE MECHANISMS AND IMPLICATIONS FOR CARDIOVASCULAR DISEASE.....	266-271

Dimash Davletov, Mukhtar Kulimbet, Indira Baibolsynova, Sergey Lee, Ildar Fakhraiyev, Alisher Makhmutov, Batyrbek Assembekov, Kairat Davletov.	
ESTIMATING THE PREVALENCE OF FAMILIAL HYPERCHOLESTEROLEMIA IN STROKE AND TRANSITORY ISCHEMIC ATTACK POPULATION: A SYSTEMATIC REVIEW AND META-ANALYSIS.....	272-281
Anas Ali Alhur, Abdullah Saeed, Anas Almalki, Hawra Alhamad, Hafez Meagammy, Norah Al Sharaef, Sarah Alakeel, Saeed Alghamdi, Abdulaziz Alqarni, Mohammed Alqarni, Muhannad Alshehri, Naif Alotaibi, Salman Almutairi, Rayan Alajhar, Adel Al-Harthi.	
IS HEALTH AT RISK? A QUANTITATIVE STUDY ASSESSING THE IMPACT OF EXCESSIVE MOBILE APPLICATION USE ON PHYSICAL AND MENTAL WELL-BEING AMONG ADULTS IN SAUDI ARABIA.....	282-288
Khatuna Kudava.	
ONYCHODYSTROPHIES IN PEDIATRIC DERMATOLOGY.....	289-292

## THE IMPACT OF ANEMIA ON THE DEVELOPMENT OF INCISIONAL HERNIA, PROSPECTIVE STUDY

Emzar Diasamidze<sup>1</sup>, Tamaz Gvenetadze<sup>1</sup>, Giorgi Antadze<sup>2</sup>, Iamze Taboridze<sup>1</sup>, Giorgi Giorgobiani<sup>3</sup>.

<sup>1</sup>David Aghmashenebeli University of Georgia, Georgia.

<sup>2</sup>Batumi Shota Rustaveli State University, Georgia.

<sup>3</sup>Tbilisi State Medical University, Georgia.

### Abstract.

**Objective:** An incisional hernia is a common postoperative complication following abdominal surgery, influenced by various contributing factors, including the patient's comorbidities and the surgical technique used. The role of perioperative anemia in the development of incisional hernia remains insufficiently studied. The aim of the study is to determine the role of anemia in the manifestation of incisional hernia.

**Materials and Methods:** The study included patients who underwent either elective or emergency abdominal surgery. Postoperative follow-up lasted for 18 months. The patients were classified into two groups: those with anemia (preoperative or within the early postoperative period) and those without anemia. The primary outcome of the study was the development of incisional hernia during the follow-up observation period, while the secondary outcomes included wound complications and recurrence.

**Results:** The incidence Incisional hernia was significantly higher in the anemic group compared to the non-anemic group: 39.2% vs. 8.1% respectively

Surgical site infection significantly more frequent in the anemia group - 10(12.66%) vs. 4(1.91%); p=0.008). Wound dehiscence was also statistically significantly higher among anemic patients - 4(5.06%) vs. 2(0.96%), p=0.030. The mean length of hospital stay was significantly longer in the anemia group (6+1.2 vs. 4+0.9 days, p< 0.0001). Anemia - OR=6.804(95% CI:3.249-14.249), duration of surgery - OR=1.045(95% I:1.009-1.082), and female gender OR=3.054(95% CI:1.434-6.504) increased the risk of developing postoperative hernia.

### Conclusions:

1 Anemia, whether present preoperatively or within the first 72 hours after the surgery, significantly increases risks of incisional hernia following abdominal surgery (OR=3.054(95% CI:1.434-6.504).

1 Early identification and correction of anemia may serve as a preventive strategy for surgical patients at risk of developing incisional hernia.

**Key words.** Anemia, risk incisional hernia, complications.

### Introduction.

Incisional hernia is one of the most common postoperative complications following abdominal surgery [1], rates range between 4% and 10.5%. However, these estimates relied solely on inpatient data, inevitably underestimating the true rate of IH, as evidenced by the rate of 13% to 25% [2]. This type of hernia develops at the site of the surgical incision and may manifest months or even several years after the initial procedure. While the technical aspects of surgery, such as suture material, incision type, and closure technique, have been well-studied, increasing

attention is now being directed toward modifiable patient-related factors that influence wound healing and the integrity of the abdominal wall [3]. The incidence of IH depends on the primary surgical pathology, incision site and extent, associated medical comorbidities, and risk factors [4].

One such factor is anemia - a condition defined by the World Health Organization (WHO) as a hemoglobin level below 13 g/dL in men and below 12 g/dL in women [5]. Anemia is common among surgical patients, particularly those undergoing major abdominal procedures. It has been documented that approximately 40% of such patients exhibit preoperative anemia [6]. Despite its high prevalence, anemia is often undertreated, even though growing evidence indicates that it negatively impacts wound healing and postoperative recovery [7].

The biological rationale linking anemia and incisional hernia is based on the critical role of oxygen in tissue recovery. Hemoglobin plays an essential role in transporting oxygen to healing tissues. Oxygen is required for various cellular processes, including fibroblast proliferation, collagen synthesis, and neovascularization [6]. Hypoxia, which can be exacerbated by anemia, impairs fibroblast function and collagen deposition, both of which are vital for maintaining the integrity of fascial closure [7]. In addition, oxygen tension at the wound site significantly influences the tensile strength of healing tissue; therefore, anemia may delay wound healing and increase the likelihood of hernia formation [8].

Emerging evidence suggests that anemia is associated with an increased risk of wound complications, including dehiscence and infections, both of which are significant risk factors for incisional hernia formation [9]. For example, a large-scale retrospective analysis conducted by Musallam et al. demonstrated that even mild preoperative anemia is independently associated with increased postoperative morbidity and mortality, including wound-related complications [10]. Another study focusing on colorectal surgery found that anemic patients had significantly higher rates of wound infections and impaired wound healing, which may contribute to fascial dehiscence and subsequent hernia development [11].

Despite these associations, the specific link between preoperative anemia and the subsequent development of incisional hernia remains underexplored in the literature. Most existing studies primarily focus on anemia as a contributing factor to surgical site infections or general wound complications, rather than on incisional hernia itself [12]. Furthermore, many studies aggregate risk factors without isolating anemia as an independent variable, making it difficult to draw direct causal conclusions [13].

From a surgical and anesthetic perspective, anemia can also affect intraoperative management. Reduced oxygen-carrying

capacity may necessitate the use and maintenance of higher oxygen concentrations and, in some cases, require blood transfusion, an intervention itself associated with increased postoperative complications [14]. Additionally, blood transfusion has been linked to immunomodulation and a higher incidence of surgical infections, potentially exacerbating the risk of incisional hernia in anemic patients [15]. Thus, both the direct and indirect effects of anemia may have a meaningful impact on the wound healing process in surgical patients.

Poor nutritional status and comorbidities such as diabetes mellitus and chronic obstructive pulmonary disease (COPD) are acknowledged, anemia is rarely considered a predictive risk factor as an independent variable [16]. This oversight may limit the ability of current risk models to fully assess the potential for hernia development in the postoperative period.

Currently, several clinical guidelines recommend identifying and correcting anemia prior to elective surgery, when feasible, through the use of iron supplementation, erythropoiesis-stimulating agents, or blood transfusions if necessary [17,18]. However, the impact of these interventions on the prevention of incisional hernia has not yet been definitively studied.

The aim of the study is to determine the role of anemia in the manifestation of incisional hernia.

## Materials and Methods.

A prospective clinical study was conducted at Batumi Republican Clinical Hospital from January 2020 to January 2025. A total of 306 patients who underwent scheduled or emergency abdominal participated in the study. After applying the inclusion and exclusion criteria, 288 patients - 156 women and 132 men, were finally included in the study. The patients included in the study were aged 45-70 years. The primary surgeries were major interventions on the small or large intestine, including for cancer.

Of the total study population, 79 patients (27.4%) were classified into the anemia group — including those with preoperative anemia (47 patients) and those who developed anemia within the first 72 hours after surgery (32 patients). The main objective of the study was to identify the potential relationship between preoperative or early postoperative anemia and the development of incisional hernia.

The study included patients who underwent elective or emergency abdominal surgery and remained on the registry for 18 months after surgery to assess whether anemia increased the risk of postoperative incisional hernia.

Exclusion criteria included: pre-existing ventral or incisional hernia, anticipated life expectancy of less than 6 months post-surgery, or absence of laboratory data.

Patients were divided into two groups based on the presence or absence of anemia.

Anemia was defined as a hemoglobin level <13.0 g/dL in men and <12.0 g/dL in women.

Patients in the anemia group met one or both of the following criteria: Preoperative anemia; Anemia that developed within the first 72 hours after surgery, as detected through routine postoperative laboratory testing.

In addition, other patient data have been collected: demographic; age, sex, body mass index (BMI), smoking status; comorbidities;

diabetes mellitus, hypertension, chronic obstructive pulmonary disease; Surgical criteria: type and duration of surgery, type of incision (midline/paramedian), surgical closure technique, use of drains and antibiotic prophylaxis; Postoperative outcome: presence of surgical site infection, wound dehiscence, reoperation, and length of hospital stay.

## Statistical Analysis:

For qualitative indicators, frequency and percentage values were determined, for quantitative indicators - mean and standard deviation. The difference between groups was determined using the Student's test for quantitative indicators, and the Chi-square test for qualitative indicators; Multiple logistic regression was conducted to account for covariates, including age, gender, Anemia, Duration of surgery (min). Statistical analysis was performed using the SPSS 23 software package.

## Results.

Comparison of patient characteristics across groups is given in Table 1.

The primary outcome of the study was the development of incisional hernia during the observation period, while the secondary outcome included wound complications and recurrences, comparing the incidence between anemic and non-anemic patients.

There were no differences between the groups in terms of baseline characteristics - age and comorbidities, as well as surgical factors.

The average age is significantly higher in the anemia group - 57+4.1 years vs 55+5.2 years in the non-anemia group (p=0.029). The mean BMI was similar between groups (28.2+2.7 vs. 27.9+1.4 kg/m<sup>2</sup>, p=0.210).

Smoking prevalence was 21(26.58)% in the anemic group and 46(22.01%) in the non-anemic group(p=0.478); Comorbidities, including diabetes mellitus - 19(12.66%) vs. 26(12.44%) - p=0.961, hypertension - 10(12.66%) vs. 30(14.35%) - p=0.711, and COPD 6(7.59%) vs. 15(7.18%) - p=0.904, A midline incision was performed in 68(86.08%) and 184(88.04%), respectively(p=0.654). Drains were used in 25(31.65%) of anemic patients and 61(29.19%) of non-anemic patients - p=0.685 showed no significant differences.

The average operative time in the anemia group was 132+15 minutes, while in the non-anemia group it was 141+18 minutes, which is longer, although the difference is not statistically significant(p=0.080).

Surgical site infection occurred significantly more in the anemia group - 10(12.66%) vs. 4(1.91%); p=0.008). Wound dehiscence was also statistically significantly higher among anemic patients - 4(5.06%) vs. 2(0.96%), p=0.030. The mean length of hospital stay was significantly longer in the anemia group (6+1.2 vs. 4+0.9 days, p< 0.0001).

Incisional hernia incidence during exposure to anemia is given in Table 2.

The incidence Incisional hernia was significantly higher in the anemic group compared to the non-anemic group: 39.2% vs. 8.1% respectively (Figure 1).

As we can see, the incidence of incisional hernia is significantly higher in the anemia group.

**Table 1.** Comparison of patients in the anemia and non-anemia groups.

Variable		Anemia group (n= 79)	Non-anemia group (n= 209)	t or Chi-square	p
<b>Demographic</b>	Age (years), mean $\pm$ SD	57 $\pm$ 4.1	55 $\pm$ 5.2	-2.19	0.029
	BMI (kg/m <sup>2</sup> ), mean $\pm$ SD	28.2 $\pm$ 2.7	27.9 $\pm$ 1.4	-1.26	0.2100
	Smoking (%)	21(26.58%)	46 (22.01%)	0.50	0.478
<b>Comorbidities</b>	Diabetes mellitus (%)	10(12.66%)	26 (12.44%)	0.002	0.961
	Hypertension (%)	10(12.66%)	30(14.35)	0.14	0.711
	COPD (%)	6(7.59%)	15(7.18%)	0.02	0.904
<b>Surgical criteria</b>	Duration of surgery (min) mean $\pm$ SD	132 $\pm$ 15	136 $\pm$ 18	1.76	0.080
	Incision: midline-n (%)	68(86.08%)	184(88.04%)	0.20	0.654
	Drains used - n (%)	25(31.65%)	61(29.19%)	0.17	0.685
<b>Postoperative outcome</b>	Surgical site infection - n(%)	10(12.66%)	4(1.91%)	7.06	0.008
	Wound dehiscence (%)	4(5.06%)	2(0.96%)	4.74	0.030
	Length of hospital stay (days), mean	6 $\pm$ 1.2	4 $\pm$ 0.9	-15.28	< 0.001

**Table 2.** Incisional hernia incidence during exposure to anemia.

	Patients with incisional hernia	Patients without incisional hernia	Total	Chi-square	p
Patients with anemia	31	48	79		
Patients without anemia	17	192	209	39.94	p<0.0001

**Table 3.** Estimating the risk of developing incisive hernias in anemia.

Risk estimate	Value	95%CI
Risk in Exposed to anemia	39.24%	29.2- 50.28
Risk in Unexposed anemia	8.13%	5.07-12.71
Risk Ratio	4.82	2.83-8.21
Risk Difference	31.11%	19.72-42.49

**Table 4.** Incisional hernia risk assessment.

	B	S.E.	Wald	p	OR	95% C.I. for OR	Lower	Upper
Age	0.023	0.022	1.109	0.2920	1.024	0.98	1.069	
Anemia	1.917	0.377	25.845	0.0000	6.804	3.249	14.249	
Duration of surgery (min)	0.044	0.018	6.106	0.0130	1.045	1.009	1.082	
Female	1.117	0.386	8.383	0.0040	3.054	1.434	6.504	
Constant	-9.831	2.568	14.66	0.0000	0			

The risk assessment for developing a hernia is given in Table 3.

As the table shows, anemia increases the risk of developing incisional hernias (RR=4.82, 95%CI:2.83-8.21).

Among them, 21(26.6%) had preoperative anemia and 10 (12.7%) developed anemia postoperatively. incisional hernia developed in 50% of the preoperative anemia group and of the postoperative group - p=0.2600

The time to herniation was also shorter in the anemic group, 2 $\pm$ 0.4 months vs. 5.3 $\pm$ 0.6 months respectively (t=31.41, p<0.0001). Postoperative wound complications (e.g., surgical wound infection, wound dehiscence, seroma) occurred in 19% of anemic patients and 4% of non-anemic patients.

We conducted a multivariate logistic regression analysis. The dependent variable was the existence or absence of hernia, while the independent factors included the presence or absence of anemia, age, gender, and operation duration (table 4).

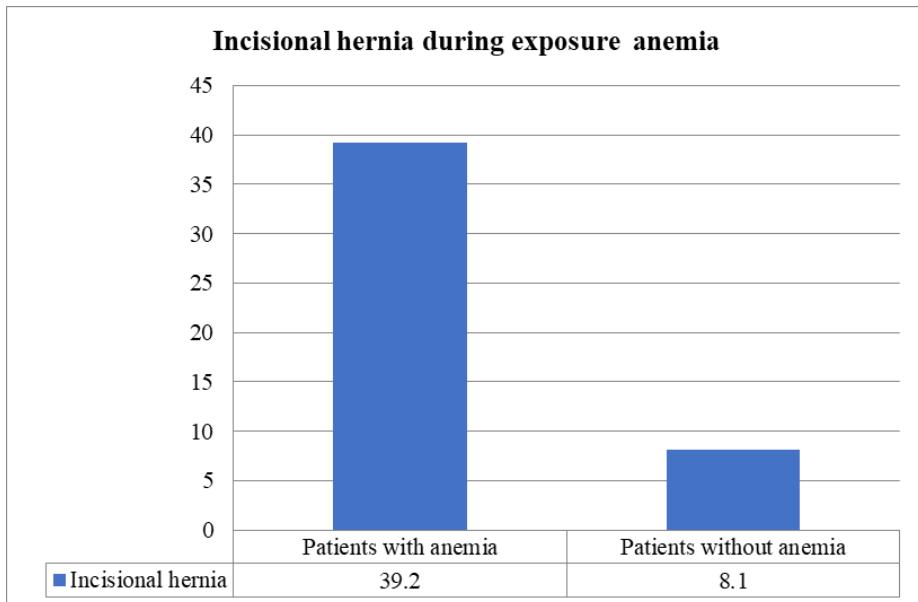
Multivariate logistic regression analysis identified the following as risk factors: anemia- OR=6.804(95% CI:3.249-14.249), duration of surgery OR=1.045(95% I:1.009-1.082), and female gender OR=3.054(95% CI:1.434-6.504).

#### Discussion.

Incisional hernias (IH) are a frequent complication following open abdominal surgery [19], with significant implications for patient quality of life and healthcare costs [20].

The incidence of recurrent incisional hernias is approximately 20% of incisional hernias [21]; In our study, incisional hernia was detected in 48 (16.67%) of 288 patients, Incisional hernia was significantly higher in the anemic group compared to the non-anemic group: 39.2% vs. 8.1% respectively.

Risk factors like hypertension, diabetes mellitus, anemia and emergency surgery are the major risk factors for abdominal wound dehiscence [22]. However, some studies suggest that



**Figure 1.** The incidence Incisional hernia was significantly higher in the anemic group compared to the non-anemic group, 39.2% vs. 8.1% respectively.

variables that are widely considered risk factors for the initial development of incisional hernias (obesity, diabetes, smoking) do not play a significant role in the development of recurrence [23]. According to our study, Smoking, Comorbidities, including diabetes mellitus, hypertension and COPD showed no significant differences between the anemia and non-anemia groups.

There is statistical significance in post-operative outcomes percentage of serious surgical site infection, transfusion, and unplanned remission in those with preoperative anemia who underwent VHR [24].

According to our study, patients who had anemia before surgery had a higher incidence of postoperative complications, namely, they had significantly more Surgical site infection, Wound dehiscence.

Preoperative anemia prolongs patient hospital stay [25]. According to our study, the mean length of hospital stay was longer in the anemia group.

Post-operative wound infection, obesity and anemia were the crucial factors for the development of incisional hernias [26].

Preoperative anemia is a risk factor for poor postoperative outcomes in those undergoing ventral hernia repair and should be considered when evaluating a patient for repair [27].

Our research confirmed that anemia increases the risk of developing incisional hernias.

## Conclusion.

- Anemia, whether present preoperatively or within the first 72 hours after the surgery, significantly increases risks of incisional hernia following abdominal surgery (OR=3.054(95% CI:1.434-6.504).

- Early identification and correction of anemia may serve as a preventive strategy for surgical patients at risk of developing incisional hernia.

## Limitations.

The paper presents a single-center study.

## REFERENCES

1. Harji D, Thomas C, Antoniou SA, et al. A systematic review of outcome reporting in incisional hernia surgery. *BJS open*. 2021;5:zrab006.
2. Rios-Diaz AJ, Cunning J, Hsu JY, et al. Incidence, burden on the health care system, and factors associated with incisional hernia after trauma laparotomy. *JAMA surgery*. 2021;156:e213104.
3. Henriksen NA, Bougard H, Gonçalves MR, et al. Primary ventral and incisional hernias: comprehensive review. *BJS open*. 2025;9:zrae145.
4. Omar I, Zaimis T, Townsend A, et al. Incisional hernia: a surgical complication or medical disease?. *Cureus*. 2023;15.
5. World Health Organization. Guideline on haemoglobin cutoffs to define anaemia in individuals and populations. World Health Organization; 2024.
6. Froessler B, Palm P, Weber I, et al. Reply: The important role for intravenous iron in perioperative patient blood management in major abdominal surgery: a randomized controlled trial. *Annals of surgery*. 2018;267:e49-50.
7. Muñoz M, Laso-Morales MJ, Gómez-Ramírez S, et al. Pre-operative haemoglobin levels and iron status in a large multicentre cohort of patients undergoing major elective surgery. *Anaesthesia*. 2017;72:826-34.
8. Han X, Ju LS, Irudayaraj J. Oxygenated wound dressings for hypoxia mitigation and enhanced wound healing. *Molecular pharmaceutics*. 2023;20:3338-55.
9. Jaison K, Muthukumaran G. The Role of Serum Protein, Haemoglobin, and BMI as Predictors of Postoperative Morbidity and Mortality in Major Surgeries. *Journal of Pharmaceutical Research International*. 2021;33:728-35.
10. Musallam KM, Tamim HM, Richards T, et al. Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study. *The Lancet*. 2011;378:1396-407.

11. Leaper DJ. Risk factors for and epidemiology of surgical site infections. *Surg Infect (Larchmt)*. 2010;11:283-287.
12. Burton BN, Alison M, Brovman EY, et al. Optimizing preoperative anemia to improve patient outcomes. *Anesthesiology Clinics*. 2018;36:701-713.
13. Gelebo KG, Neme D, Destaw B, et al. The effect of preoperative anemia on perioperative outcomes among patients undergoing emergency surgery: A multicenter prospective cohort study. *Heliyon*. 2023;9.
14. Meybohm P, Schmitt E, Choorapoikayil S, et al. German Patient Blood Management Network: effectiveness and safety analysis in 1.2 million patients. *British Journal of Anaesthesia*. 2023;131:472-81.
15. Rohde JM, Dimcheff DE, Blumberg N, et al. Health care-associated infection after red blood cell transfusion: a systematic review and meta-analysis. *Jama*. 2014;311:1317-26.
16. Luijendijk RW, Hop WC, Van Den Tol MP, et al. A comparison of suture repair with mesh repair for incisional hernia. *New England Journal of Medicine*. 2000;343:392-8.
17. van Ramshorst GH. Risk factors for incisional hernia in a randomized trial of midline vs transverse abdominal incision. *Arch Surg*. 2012;147:707-712.
18. Deivita Y, Syafruddin S, Andi Nilawati U, et al. Overview of Anemia; risk factors and solution offering. *Gac Sanit*. 2021;35:S235-S241.
19. Perim V, Nogueira R, Kasakewitch JP, et al. Incisional hernia incidence following laparoscopic versus open abdominal surgery: an updated systematic review and meta-analysis of randomized controlled trials. *Hernia*. 2025;29:1-3.
20. Kanani F, Messer N, Zahalka A, et al. Abdominal Incisions and Hernia Development: A Systematic Review and Meta-Analysis of Risk Factors. *The American Surgeon™*. 2025;00031348251378903.
21. Köckerling F. Recurrent incisional hernia repair—an overview. *Frontiers in Surgery*. 2019;6:26.
22. Durrani KK, Ilyas S, Shah U, et al. Association of Pre-Operative Risk Factors with Abdominal Wound Dehiscence. *Pakistan Armed Forces Medical Journal*. 2025;75.
23. Grigorova V. Factors influencing recurrence in conventional surgical treatment of incisional hernias—a comparative analysis of our own experience and the available literature. *InVarna Medical Forum*. 2025;14:2.
24. Soni AK, Sahu SK, RK VK. A study on clinical profile and risk factors in incisional hernia patients. *Panacea Journal of Medical Sciences*. 2023;12:528-32.
25. Koch CG, Li L, Sun Z, et al. Magnitude of anemia at discharge increases 30-day hospital readmissions. *Journal of patient safety*. 2017;13:202-6.
26. Reeves N, Torkington J. Prevention of surgical site infections. *Surgery (Oxford)*. 2024;42:800-4.
27. Benner C, Spence KT, Childers WK. Preoperative anemia is a risk factor for poor perioperative outcomes in ventral hernia repair. *Hernia*. 2022;26:1599-604.