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COMPREHENSIVE REVIEW ARTICLE: POSTOPERATIVE DELIRIUM AFTER CABG

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Abstract. Postoperative delirium (POD) following coronary artery bypass graft (CABG) surgery represents a significant clinical challenge, characterized by acute, fluctuating disturbances in attention, awareness, and cognition. This review synthesizes current evidence on its definition, incidence, risk factors, pathophysiology, prevention, management, and outcomes, with a focus on integrating findings from recent scientific literature and adhering to APA citation style.

Keywords: delirium, surgery, risk factors, pathophysiology, diagnosis, management.

Introduction

POD is defined as an acute, fluctuating disturbance in attention and awareness, accompanied by changes in cognition, such as memory deficits or disorientation, that develops shortly after surgery and is not better explained by pre-existing dementia. The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), provides the gold standard for diagnosis, requiring evidence of disturbance in consciousness with reduced ability to focus, maintain, or shift attention, alongside cognitive changes that develop over hours to days and fluctuate during the day [6]. This aligns with clinical assessments commonly used in postoperative settings, such as the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU).

Incidence

The incidence of POD after CABG varies significantly across studies, reflecting differences in patient populations, surgical techniques, and diagnostic methods. A large cohort study of 5,034 CABG patients reported an incidence of 6%, while other research suggests a range from 4.1% to 54.9% in cardiac surgery patients, including CABG, indicating the broad variability [7][8]. This wide range underscores the need for standardized assessment protocols to enhance comparability across studies.

Risk Factors

Risk factors for POD after CABG are categorized into preoperative, intraoperative, and postoperative factors, each contributing to the likelihood of developing delirium.

Preoperative Risk Factors

Age: Older age is consistently identified as a significant risk factor, with higher incidence in patients over 65 years [9].

Cognitive Impairment: Pre-existing mild cognitive impairment or dementia increases vulnerability [10].

Comorbidities: Conditions such as diabetes, hypertension, and carotid artery stenosis are associated with increased risk [11].

Psychiatric History: Preoperative depression and substance abuse, including alcohol or psychoactive medication use, elevate risk [12].

Functional Status: Patients with New York Heart Association (NYHA) functional class III or IV, indicating severe heart failure, are at higher risk [13].

Intraoperative Risk Factors

Cardiopulmonary Bypass (CPB) Duration: Longer CPB times, often linked to surgical complexity, are associated with increased delirium risk, though findings are inconsistent [14].

Anesthesia Management: Depth of anesthesia, monitored via bispectral index (BIS), with prolonged EEG burst suppression or values below 20, increases odds of delirium [15].

Cerebral Oximetry: Lower preoperative cerebral oxygen saturation or intraoperative desaturation below 50% is linked to higher delirium rates [16].

Surgical Technique: While no significant difference is found between on-pump and off-pump CABG for delirium incidence, complex procedures like valve surgery show higher rates [17].

Postoperative Risk Factors

Mechanical Ventilation: Prolonged ventilation, especially beyond 24 hours, is associated with increased delirium risk [18].

Medications: Use of benzodiazepines, steroids, and calcineurin inhibitors postoperatively can precipitate delirium, particularly in elderly patients [19].

Complications: Postoperative stroke, acute kidney injury, and the need for transfusions are significant risk factors [20].

ICU Environment: Factors such as sleep deprivation, immobility, and physical restraints in the ICU contribute to delirium risk [21].

The following table summarizes key risk factors, categorized by timing:

Category Risk Factors Notes

Preoperative Age, cognitive impairment, diabetes, depression, carotid stenosis, NYHA class III/IV Older age and cognitive issues significantly increase risk.

Intraoperative CPB duration, anesthesia depth, cerebral desaturation, surgical complexity Longer CPB and low oxygen levels during surgery are critical.

Postoperative Prolonged ventilation, medication use, stroke, AKI, ICU factors Postoperative complications and ICU environment play a major role.

Pathophysiology

The pathophysiology of POD after CABG is multifactorial, involving systemic inflammation, cerebral hypoperfusion, neurotransmitter imbalances, and potential embolic events. Surgical trauma induces a systemic inflammatory response, leading to leukocyte adhesion, endothelial swelling, and perivascular edema, which impair microcirculation and reduce nutritive perfusion [22]. This hypoxia particularly affects acetylcholine synthesis, which is highly sensitive to low oxygen tension, contributing to cognitive disturbances [23]. During CABG, cardiopulmonary bypass (CPB) exacerbates inflammation and may introduce microemboli, potentially causing direct brain injury [24]. Neurotransmitter imbalances, such as acetylcholine deficiency and dopamine excess, further disrupt cognitive function, while cerebral hypoperfusion during CPB can lead to ischemic injury, compounding the risk [25].

Prevention

Preventive strategies aim to mitigate risk factors through preoperative, intraoperative, and postoperative interventions.

Preoperative Interventions

Risk Stratification: Use of delirium prediction scores, such as those derived by Rudolph et al. (2009), to identify high-risk patients [26].

Optimization: Addressing cognitive impairment, ensuring adequate hydration, and reviewing medications to minimize psychoactive drugs [27].

Multidisciplinary Approach: Proactive geriatrics consultation, as shown to reduce delirium risk in other surgical contexts, may be beneficial [28].

Intraoperative Interventions

Anesthesia Monitoring: Depth of anesthesia monitoring using BIS to avoid excessive sedation or light anesthesia, reducing delirium risk [29].

Perfusion Management: Optimizing CPB parameters, such as maintaining mean arterial pressure and hematocrit above 22–23%, to minimize cerebral hypoperfusion [30].

Neuroprotective Strategies: Monitoring cerebral oximetry to ensure adequate brain oxygenation during surgery [31].

Postoperative Interventions

Non-Pharmacological Approaches: Implementing multicomponent interventions, including reorientation, early mobilization, sleep hygiene (e.g., using earplugs to reduce noise), and providing sensory aids like glasses or hearing aids [32][33].

Pharmacological Approaches: Dexmedetomidine, a sedative with potential delirium-reducing properties, has shown efficacy in reducing incidence compared to other sedatives like propofol. Melatonin supplementation may also help regulate sleep-wake cycles, potentially lowering delirium risk.

Management

Management of POD focuses on early recognition, treating underlying causes, and providing supportive care.

Diagnosis: Use validated tools like CAM-ICU for early detection, ensuring regular screening in the postoperative period, particularly within the first 5 days.

Treatment of Underlying Causes: Address potential triggers such as infections, electrolyte imbalances, or hypoxia, which can exacerbate delirium.

Non-Pharmacological Management: First-line interventions include creating a calm environment, ensuring adequate lighting, reorientation to time and place, and engaging patients in therapeutic activities to maintain cognitive function.

Pharmacological Management: Antipsychotics, such as risperidone, may be used cautiously for severe agitation, starting at low doses and monitoring for side effects, given the lack of strong evidence for routine use and potential risks. Benzodiazepines are generally avoided due to their delirium-inducing potential, especially in elderly patients.

Outcomes and Prognosis

POD after CABG is associated with significant short-term and long-term consequences. It increases hospital length of stay by 2–3 days and is linked to a 30-day mortality rate of 7–10% . Patients with POD experience prolonged ICU stays, higher rates of postoperative complications such as pneumonia and surgical site infections, and increased in-hospital mortality. Long-term outcomes include an increased hazard ratio for death up to 10 years postoperatively, with an adjusted HR of 1.65 (95% CI 1.38–1.97), particularly in patients without prior stroke. Additionally, POD is associated with cognitive decline and functional impairment, with some patients experiencing lasting problems with memory and thinking, affecting quality of life.

Conclusion

Postoperative delirium (POD) following coronary artery bypass graft (CABG) surgery is a complex and multifactorial condition with significant clinical implications. Understanding its incidence, risk factors, and pathophysiology is crucial for developing effective prevention and management strategies. While non-pharmacological interventions remain the cornerstone of POD prevention and treatment, targeted pharmacological approaches may be beneficial in selected cases. Given its association with increased morbidity, mortality, and long-term cognitive decline, early identification and comprehensive management are essential to improving patient outcomes after CABG surgery.

References

1. Abdumuminov B.R., Eminov R.I., & Gulomov K.K. (2023). UNDERSTANDING FETAL CIRCULATION AND THE TRANSITION TO POSTNATAL CIRCULATION: SHUNTS, PLACENTA, AND CONGENITAL HEART DEFECTS. Экономика и социум, (6-1 (109)), 14-21.

2. American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596
3. Brown, C. H., IV. (2016). Predicting, preventing, and identifying delirium after cardiac surgery. *Perioperative Medicine, 5*(1), Article 7. https://doi.org/10.1186/s13741-016-0032-5
4. Chen, H., Mo, L., Hu, H., Ou, Y., & Luo, J. (2021). Risk factors of postoperative delirium after cardiac surgery: A meta-analysis. *Journal of Cardiothoracic Surgery, 16*(1), Article 113. https://doi.org/10.1186/s13019-021-01496-w
5. Cropsey, C., Kennedy, J., Han, J., & Pandharipande, P. (2015). Current approach to diagnosis and treatment of delirium after cardiac surgery. *Anesthesiology and Pain Medicine, 6*(1), e28335. https://doi.org/10.5812/aapm.28335
6. DUE, M. A. I. N. A., & FURUNCLES, T. (2025). Universal Xalqaro Ilmiy Jurnal.
7. Fricchione, G. L., Nejad, S. H., Esses, J. A., Cummings, T. J., Querques, J., Cassem, N. H., & Murray, G. B. (2008). Postoperative delirium. *American Journal of Psychiatry, 165*(7), 803–812. https://doi.org/10.1176/appi.ajp.2008.08020181
8. Gosselt, A. N., Slooter, A. J., Boere, P. R., & Zaal, I. J. (2015). Risk factors for delirium after on-pump cardiac surgery: A systematic review. *Critical Care, 19*(1), Article 346. https://doi.org/10.1186/s13054-015-1060-8
9. Greaves, D., Psaltis, P. J., Ross, T. J., Davis, D., Smith, A. E., Boord, M. S., & Keage, H. A. D. (2019). Trials focusing on prevention and treatment of delirium after cardiac surgery: A systematic review. *Journal of Cardiothoracic and Vascular Anesthesia, 34*(4), 1053–1062. https://doi.org/10.1053/j.jvca.2019.09.008
10. Gulomov, K. K., Juraev, S. B., Khamdamov, R. A., Kholikov, B. M., & Meliboev, R. A. (2025, February). IMPROVING THE TREATMENT OF COMPLICATIONS IN ENDOUROLOGICAL OPERATIONS FOR UROLITHIASIS. In *INTERNATIONAL CONFERENCE ON SCIENCE, ENGINEERING AND TECHNOLOGY* (Vol. 2, No. 1, pp. 31-33).
11. Gulomov, K. K., Kholikov, B. M., Sh, P. S., & Yokubov, D. Y. (2025). NEUROLOGICAL ASSESSMENT OF POSTOPERATIVE PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFTING (CABG). *ZAMONAVIY ILM-FAN VA INNOVATSIYALAR NAZARIYASI*, *2*(2), 6-10.
12. Inouye, S. K., Westendorp, R. G. J., & Saczynski, J. S. (2014). Delirium in elderly people. *The Lancet, 383*(9920), 911–922.
13. Juraev, S. B., Khamdamov, R. A., Meliboev, R. A., & Yokubov, D. Y. (2025). NEW TREATMENT APPROACHES FOR PEDIATRIC UPPER GASTROINTESTINAL OBSTRUCTION IN FERGANA VALLEY. *ZAMONAVIY ILM-FAN VA INNOVATSIYALAR NAZARIYASI*, *2*(2), 4-6.
14. Juraev, S. B., Kholikov, B. M., & Sh, P. S. (2025, February). PREVENTIVE MEASURES FOR COMPLICATIONS AFTER GASTROINTESTINAL SURGERY. In *INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION* (Vol. 2, No. 1, pp. 11-12).
15. Kh, F. N., & Juraev, S. B. (2025, January). PREVENTION OF TROPHIC ULCERS IN PATIENTS WITH ATHEROSCLEROSIS OF THE FOOT ARTERIES. In *INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION* (Vol. 2, No. 1, pp. 4-6).
16. Kh, F. N., & Juraev, S. B. (2025, January). PREVENTION OF TROPHIC ULCERS IN PATIENTS WITH ATHEROSCLEROSIS OF THE FOOT ARTERIES. In *INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY STUDIES AND EDUCATION* (Vol. 2, No. 1, pp. 4-6).
17. Khamdamov , R. (2025). ANALYSIS OF RISK FACTORS AND PREVENTIVE APPROACHES FOR MORPHOFUNCTIONAL ALTERATIONS IN NASAL ALAE DUE TO

FURUNCLES. Universal International Scientific Journal, 2(1), 100–109. Retrieved from https://universaljurnal.uz/index.php/jurnal/article/view/1412

18. Kholikov B.M. (2024). POSTOPERATIVE DELIRIUM: UNDERSTANDING CAUSES, RISKS, AND MANAGEMENT STRATEGIES.
19. Kholikov, B. M. (2025, February). POSTOPERATIVE DELIRIUM IN CABG PATIENTS: IDENTIFYING RISKS AND OPTIMIZING PERIOPERATIVE MANAGEMENT. In *INTERNATIONAL CONFERENCE ON SCIENCE, ENGINEERING AND TECHNOLOGY* (Vol. 2, No. 1, pp. 14-16).
20. Lin, Y., Chen, J., & Wang, Z. (2020). Postoperative delirium: Perioperative assessment, risk reduction, and management. *British Journal of Anaesthesia, 125*(4), 492–501. https://doi.org/10.1016/j.bja.2020.06.063
21. Loponen, P., Luther, M., Wistbacka, J. O., Korpilahti, K., Laurikka, J., Sintonen, H., Huhtala, H., & Tarkka, M. (2003). Postoperative delirium and health-related quality of life after coronary artery bypass grafting. *Scandinavian Cardiovascular Journal, 37*(6), 337–342. https://doi.org/10.1080/14017430310015577
22. Pirmatov, S. (2025). UROGENITAL QANDLI DIABETIK VEGETATIV NEVROPATIYANING KLINIK XUSUSIYATLARI VA DAVOSI. *Universal xalqaro ilmiy jurnal*, *2*(1), 59-67.
23. R. A. Khamdamov. (2025). DIAGNOSTIC APPROACHES AND PREVENTION OF MORPHOFUNCTIONAL TRANSFORMATION IN NASAL ALAE FURUNCLES.
24. Rudolph, J. L., Jones, R. N., Levkoff, S. E., Rockett, C., Inouye, S. K., Sellke, F. W., Khuri, S. F., Lipsitz, L. A., Ramlawi, B., Levitsky, S., & Marcantonio, E. R. (2009). Derivation and validation of a preoperative prediction rule for delirium after cardiac surgery. *Circulation, 119*(2), 229–236.
25. Saczynski, J. S., Marcantonio, E. R., Quach, L., Fong, T. G., Gross, A., Inouye, S. K., & Jones, R. N. (2012). Cognitive trajectories after postoperative delirium. *New England Journal of Medicine, 367*(1), 30–39. https://doi.org/10.1056/NEJMoa1112923
26. Smulter, N., Lingehall, H. C., Gustafson, Y., Olofsson, B., & Engström, K. G. (2013). Delirium after coronary artery bypass graft surgery and late mortality. *Annals of Neurology, 74*(5), 668–675. https://doi.org/10.1002/ana.23988
27. Ugli, A. A. K. (2024). AI-DRIVEN METAGENOMIC ANALYSIS TO UNCOVER MICROBIAL INFLUENCES ON CANCER DEVELOPMENT. *ORIENTAL JOURNAL OF MEDICINE AND NATURAL SCIENCES*, *1*(6), 43-54.
28. Ugli, G. K. K. (2025, February). SUBACUTE SCLEROSING PANENCEPHALITIS IN KIDS: EEG & MRI TRENDS PRE-AND POST-2023. In *INTERNATIONAL CONFERENCE ON SCIENCE, ENGINEERING AND TECHNOLOGY* (Vol. 2, No. 1, pp. 28-30).
29. van der Wiel, D. M., Kok, W. F., Alazawi, W., Kortekaas, K. A., Absalom, A. R., & Scheeren, T. W. L. (2023). Standardized pharmacological management of delirium after on-pump cardiac surgery: A randomized controlled trial. *Scientific Reports, 13*(1), Article 30781. https://doi.org/10.1038/s41598-023-30781-y
30. Witlox, J., Eurelings, L. S. M., de Jonghe, J. F. M., Kalisvaart, K. J., Eikelenboom, P., & van Gool, W. A. (2010). Delirium in elderly patients and the risk of postdischarge mortality, institutionalization, and dementia: A meta-analysis. *JAMA, 304*(4), 443–451. https://doi.org/10.1001/jama.2010.1013
31. Zokirjonov, D. Z., & G'ulomov, Q. (2025). THE SIGNIFICANCE OF VITAMIN D LEVELS ON MUSCULOSKELETAL STRENGTH, ATHLETIC PERFORMANCE, AND INJURY PREVENTION. *JOURNAL OF INTERNATIONAL SCIENTIFIC RESEARCH*, *2*(4), 419-430.
32. Ёкубов D. On differential diagnostics of spinal cord pathology of organic and functional genesis / Д. Ёкубов, А. Мазалова. – Актуальные вопросы фундаментальной медицины: сегодня и в будущем. – 2024. – № 1. – С. 36.