

Sedation options in a cardiac catheterization laboratory and coronary care unit: protocol review and clinical experience from General Hospital Slavonski Brod

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KEYWORDS: coronary care unit, sedation, propofol, dexmedetomidine, remifentanyl.

CITATION: *Cardiol Croat.* 2026;21(1-2):46-7. | <https://doi.org/10.15836/ccar2026.46>

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Introduction: Modern cardiac catheterization laboratories and coronary care units (CCU) require sophisticated sedation protocols that balance patient comfort with hemodynamic stability and respiratory safety¹. This review presents sedation options currently implemented at General Hospital Slavonski Brod's CCU.

Protocols and Methods: We analyzed seven primary sedation agents used in our institution: propofol and propofol TCI (Target-Controlled Infusion), remifentanyl TCI, dexmedetomidine, sufentanil, fentanyl, and midazolam. Each agent's pharmacokinetics, pharmacodynamics, indications, contraindications, and adverse effects were systematically reviewed based on current literature and institutional experience (**Table 1** and **Table 2**). Our sedation protocols are tailored to specific procedures: propofol for electrical cardioversion due to rapid onset and recovery²; midazolam combined with propofol for transcatheter aortic valve implantation procedures; dexmedetomidine for mechanically ventilated patients post-cardiac arrest or myocardial infarction; and dexmedetomidine-based protocols for anxious elderly patients and non-invasive ventilation (NIV) mask tolerance enhancement^{3,4}. Each approach considers patient-specific factors including age, comorbidities, and procedural complexity. Propofol demonstrates rapid onset (30-40 seconds) with significant cardiovascular depression but predictable recovery. TCI systems provide superior concentration control and reduced side effects. Remifentanyl TCI offers precise analgesia control with ultra-short elimination half-life (3-10 minutes) but requires vigilant respiratory monitoring. Dexmedetomidine provides unique conscious sedation with minimal respiratory depression, making it ideal for prolonged sedation and NIV tolerance^{3,4}. Traditional opioids (fentanyl, sufentanil) and midazolam remain valuable for specific indications with established safety

TABLE 1. Contraindications and special warnings.

Drug	Absolute contraindications	Relative contraindications	Special warnings
Propofol	Allergy to propofol, eggs, soy	Heart failure, hypovolemia	Propofol infusion syndrome, hypertriglyceridemia
Remifentanyl TCI	Allergy to fentanyl analogues	Severe renal/hepatic insufficiency, COPD, mechanical obstruction of the GIT	Muscle rigidity, respiratory depression
Dexmedetomidine	No absolute contraindications	Bradycardia <50/min, hypotension, heart block	Bradycardia, prolonged action in the elderly
Sufentanil/ Fentanyl	Allergy to opioid analgesics, acute asthma	CNS depression, increased intracranial pressure	Respiratory depression, addiction
Midazolam	Allergy to benzodiazepines, acute glaucoma	Dementia, COPD, myasthenia gravis	Delirium in the elderly, anterograde amnesia

TCI – Target-Controlled Infusion; COPD – Chronic Obstructive Pulmonary Disease; CNS – Central Nervous System; GIT – Gastrointestinal Tract

RECEIVED:
October 19, 2025

ACCEPTED:
November 14, 2025



TABLE 2. Pharmacokinetics and pharmacodynamics.

Drug	Mechanism of action	Onset of action	Elimination half-time	Cardiovascular effects	Respiratory effects
Propofol	GABA receptor agonist	30-40 seconds	4-7 hours	Hypotension, ↓CO, bradycardia	Respiratory depression, apnea
Propofol TCI	GABA receptor agonist	30-40 seconds	4-7 hours	Hypotension, ↓CO, bradycardia	Respiratory depression, apnea
Remifentanyl TCI	μ-opioid receptor agonist	1-3 minutes	3-10 minutes	Bradycardia, hypotension	Significant respiratory depression
Dexmedetomidine	α2-adrenoreceptor agonist	15 minutes (without loading dose)	2-3 hours	Bradycardia, hypotension, initial hypertension	Minimal respiratory depression
Sufentanyl	μ-opioid receptor agonist	1-3 minutes	2.5-3 hours	Bradycardia, mild hypotension	Significant respiratory depression
Fentanyl	μ-opioid receptor agonist	1-2 minutes	3-4 hours	Bradycardia, mild hypotension	Moderate respiratory depression
Midazolam	GABA-A receptor agonist	1-3 minutes	1-4 hours	Minimal	Mild respiratory depression

TCI – Target-Controlled Infusion; ↓CO – Decreased Cardiac Output; GABA – gamma-aminobutyric acid

profiles. Each agent presents distinct contraindication patterns. Propofol requires caution in cardiac failure and hypovolemia². Dexmedetomidine necessitates monitoring for bradycardia and hypotension. Opioids demand respiratory surveillance, while midazolam may cause paradoxical reactions in elderly patients.

Conclusions: Successful sedation in cardiac catheterization laboratories and coronary units require individualized approaches based on pharmacological understanding, procedural requirements, and patient characteristics. Our institutional experience demonstrates that combined protocols utilizing multiple agents can optimize patient outcomes while maintaining safety. Continuous monitoring and staff education remain paramount for safe sedation practice.

LITERATURE

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