Hit Me With Your Best Shock
(But while I'm Asleep)
Managing Procedural Sedation for Electrical Cardioversion

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Disclosures

The planner(s) and speaker(s) have indicated that there are no relevant financial relationships with any ineligible companies to disclose.

Learning Objectives

At the end of this session, learners should be able to:

1. Identify clinical scenarios in which cardioversions and procedural sedation are indicated
2. Recognize interprofessional roles involved in procedural sedation for cardioversion
3. Assess specific factors to determine the most appropriate sedative agent for cardioversion

Abbreviation Key

AAAAI – American Academy of Allergy Asthma & Immunology

afib – Atrial fibrillation

ACEP – American College of Emergency Physicians

ACLS – Advanced Cardiovascular Life Support

APP – Advanced Practice Partner

ASA – American Society of Anesthesiologists

ASGE – American Society for Gastrointestinal Endoscopy

BP – Blood pressure

CI – Confidence interval

cm – Centimeters

CNS – Central nervous system

DCCV – Direct current cardioversion

EC – Electrical cardioversion

ED – Emergency department

EEG – Electroencephalogram

EKG – Electrocardiogram

EP – Electrophysiology

GABA – Gamma-aminobutyric acid

GERD – Gastroesophageal Reflux Disease

HFpEF – Heart failure with reduced ejection fraction

HR – Heart rate

Ht – Height

IV – Intravenous

kg – Kilograms

LOC – Level of consciousness

MAP – Mean arterial pressure

mg – Milligrams

mmHg – Millimeters of mercury

NC – Nasal cannula

NMDA – N-methyl-D-aspartate

OSA – Obstructive sleep apnea

RR – Respiratory rate

RSS – Ramsay Sedation Score

RVR – Rapid ventricular rate

SBP – Systolic blood pressure

SOB – Shortness of breath

SpO_2 – Peripheral oxygen saturation

TEE – Transesophageal echocardiogram

Wt – Weight

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Outline

- Epidemiology
- Background on Cardioversion
- Interprofessional Roles & Responsibilities
- Pharmacotherapy
- Literature Analysis of Efficacy
- Summary

Advocate Health Midwest*

Insight Into The Number of Cardioversions from January 1, 2025, to December 1st, 2025

Top 5 Hospitals

Advocate Health Hospital	Number of Cardioversions
Aurora St. Luke's Medical Center	845
Advocate Lutheran General Hospital	708
Aurora BayCare Medical Center	549
Advocate Christ Medical Center	524
Advocate Good Samaritan Hospital	521

*Southeast region data is not accessible to Midwest residents

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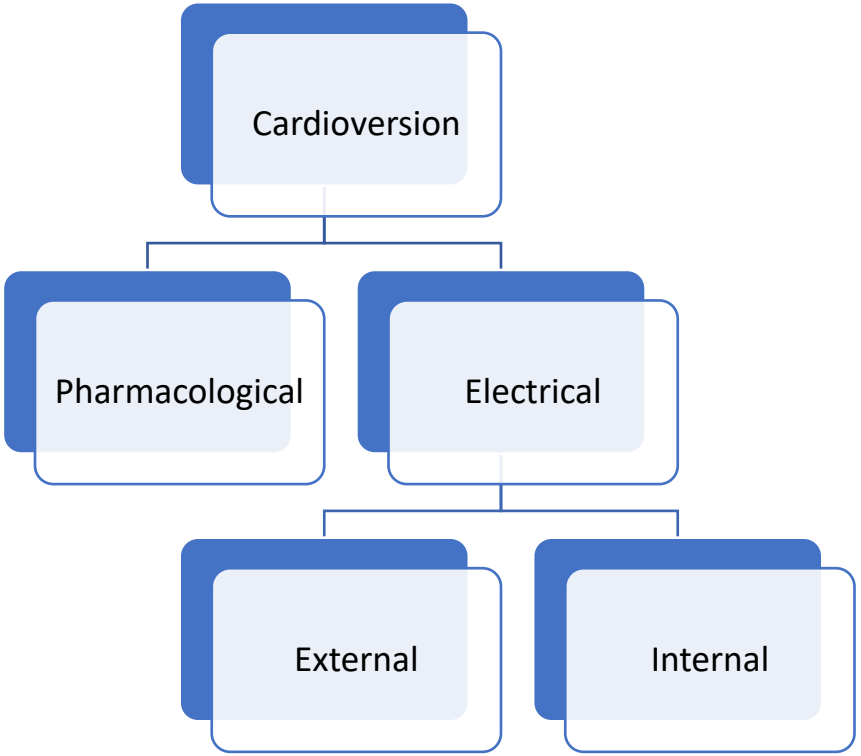
Objective: Identify clinical scenarios in which cardioversions and procedural sedation are indicated

Background

- Definition of Cardioversion
- Clinical Indications
- Patient Eligibility / Considerations

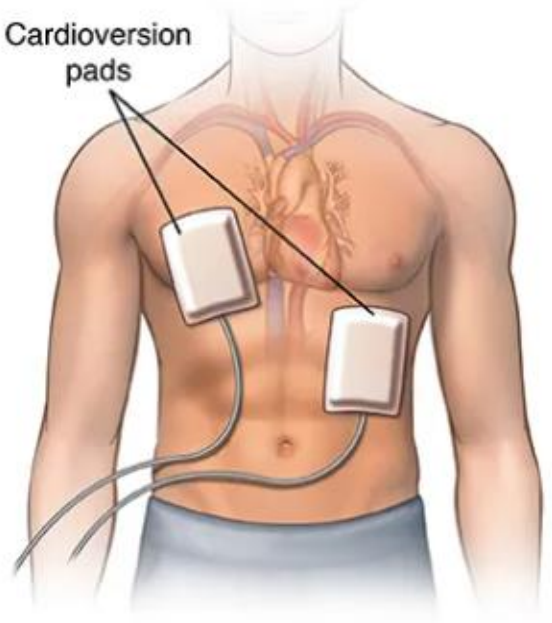
What is a Cardioversion?

- Cardioversion can be achieved electrically or pharmacologically
- Direct-current cardioversion involves an electrical shock synchronized with the intrinsic activity of the heart to restore sinus rhythm
- A mode of acute rhythm control



Electrical Cardioversion

- Electrical cardioversion involves placing pads on the patient and delivering a specified number of joules through the heart
- An initial energy of 200 J or greater is recommended for electrical cardioversion when using a biphasic defibrillator



Miller. Alex's Asteroid Astrology. 2020.

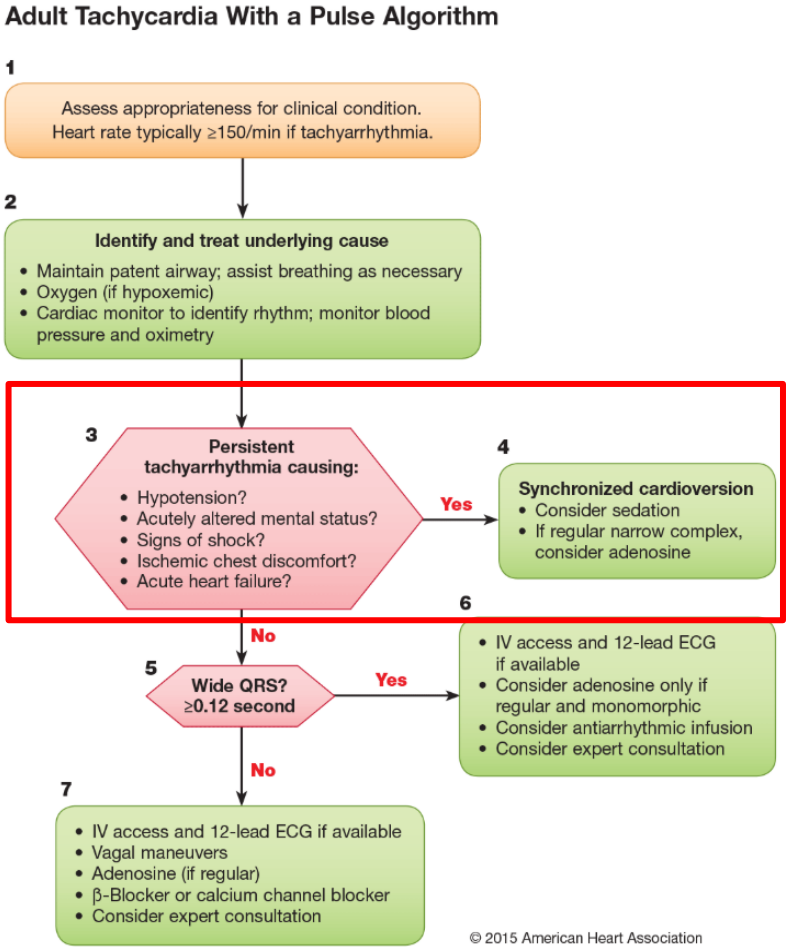
Indications for Cardioversion

- Arrythmias with cardioversions as a treatment option:
  - Atrial fibrillation
  - Atrial flutter
  - Supraventricular tachycardia
  - Ventricular tachycardia
  - Ventricular fibrillation

- Commonly used in tachycardia with HR greater than 150 bpm

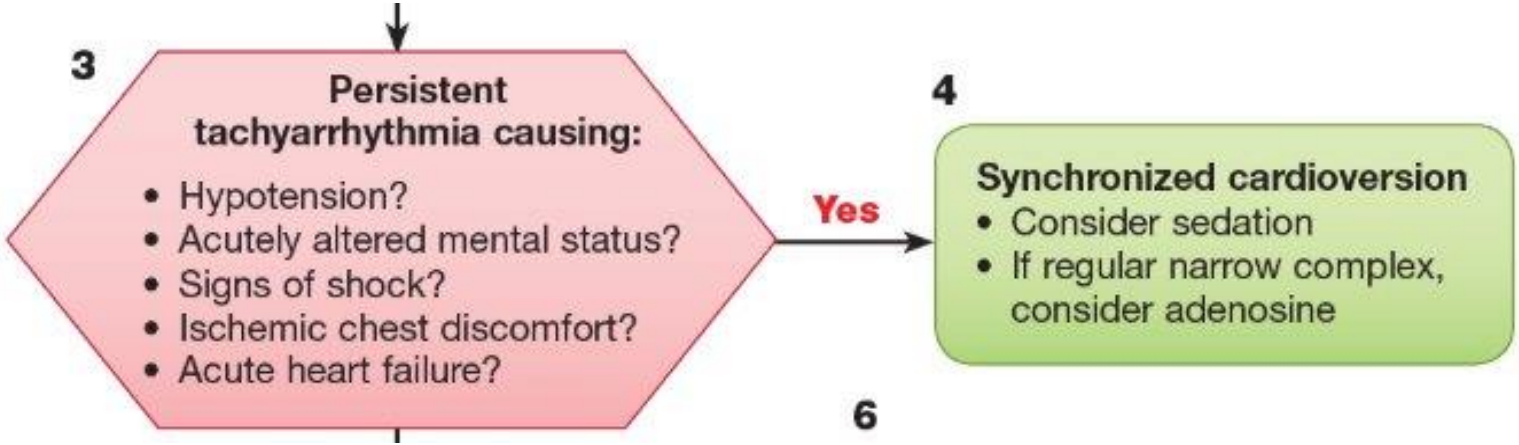
Indications for Cardioversion

Hemodynamic Instability



Indications for Cardioversion

Hemodynamic Instability



Prevalence of Atrial Fibrillation

- In the United States, it's estimated that roughly 3-6 million people have afib
- Roughly one third of patients with afib are asymptomatic
- Numbers are projected to reach 6-16 million by 2050
- Prevalence increases with ages greater than 65

Atrial Fibrillation

- Electrical cardioversion can also be used in hemodynamically stable patients
  - Initial rhythm control strategy
  - Unsuccessful pharmacological cardioversion

- In recent onset afib, there is a greater than 85% conversion rate with electrical cardioversion

- Pharmacological cardioversion has a 70% success rate

Guideline for the Diagnosis and Management of AFib. ACC/AHA/ACCP/HRS. 2023.
Klein. Cardioversion in Non-valvular Afib. 2015.

Cardioversion Complications

- ST segment and T wave changes
- Arrhythmia and conduction abnormalities
- Myocardial dysfunction
- Pulmonary edema
- Necrosis
- Cutaneous burns
- Stroke

Cardioversion and defibrillation for specific arrhythmias. UpToDate. 2025

Atrial Fibrillation Thromboembolism

- Anticoagulation is needed prior to cardioversion if:
  - Onset of afib is greater than 48 hours
    - Anticoagulation is recommended for 3 weeks before and 4 weeks after cardioversion

- No anticoagulation is needed prior to cardioversion if:
  - Transesophageal echocardiogram is used to rule out thrombus
  - Onset of afib is less than 48 hours

Clinical Guidelines

- 2024 American College of Emergency Physicians (ACEP) Guidelines for Unscheduled Procedural Sedation
- 2018 American Society of Anesthesiologists (ASA) Practice Guidelines for Moderate Procedural Sedation and Analgesia
- 2023 American Heart Association (AHA) Guideline for the Diagnosis and Management of Arial Fibrillation

Clinical guidelines offer very limited recommendations on which agents to use for procedural sedation during cardioversion. While they acknowledge that sedation is warranted, they do not provide specific guidance on agent selection.

Procedural Sedation

- “the use of anxiolytic, sedative, hypnotic, analgesic, and/or dissociative medication(s) to attenuate anxiety, pain, and/or motion. These agents are administered in order to facilitate amnesia or decreased awareness and/or patient comfort and safety during a diagnostic or therapeutic procedure.”

- General goals of sedation:
  - Reduce pain perception
  - Decrease anxiety
  - Maximizing amnesia
  - Protect the patient from injuring themselves

Green. Unscheduled Procedural Sedation. 2024.
Procedural Sedation in Adults in the emergency department. UpToDate. 2025.

Sedation Complications

- Respiratory distress
- Cardiovascular side effects
- Aspiration
- Nausea and vomiting

Procedural Sedation in Adults in the emergency department. UpToDate. 2025.

Introduction to Patient Case

A.J., a 45-year-old female patient, presents to the emergency department with new onset afib with RVR on EKG. She has been experiencing some dizziness, along with SOB and both chest pain and palpations for approximately half the day (~12 hours), which she believes seems to be worsening with time.

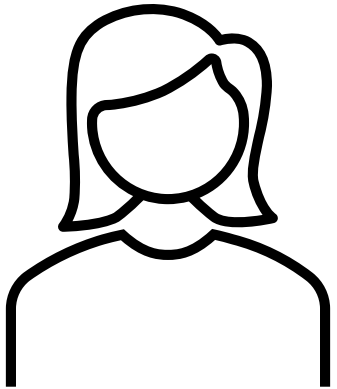
<u>Vitals in the ED:</u>

BP: 118/85 mmHg

HR: 185 beats per minute

SpO_2: 92%

RR: 22 breaths per minute



Assessment Question #1

AJ is symptomatic due to her new onset afib and may need a cardioversion. As a healthcare team we have the choice between electrical or pharmacological conversion. Which of the following patient characteristics would help us decide we need to perform a synchronized electrical cardioversion?

a. Age of 45 years old

b. Heart rate of 185 beats per minute

c. Chest pain with palpitations

d. Blood pressure 118/85 mmHg

Objective: Recognize interprofessional roles involved in procedural sedation for cardioversion

Interprofessional Roles & Responsibilities

- Required Personnel
- Supporting Personnel
- Role of Pharmacist
- Cardioversion Workflow

Required Personnel for Procedural Sedation

Per the 2024 ACEP Guidelines on unscheduled procedural sedation

- Minimum Requirements for Healthcare Personnel
  - Two trained licensed health care practitioners are required to be at bedside
    - Sedation provider
    - Sedation monitor
  - Requires proficiency in patient monitoring, cognitive and rescue skills

Advocate Health Sedation Policy by Region: Authorized Personnel for Sedation

Advocate Health Midwest- Wisconsin	Advocate Health Midwest- Illinois	Advocate Health- Southeast
○ **Anesthesia** ○ **Credentialed Physicians/APPs**	• **Credentialed Physicians/APPs**	• **Non-emergency room setting** ○ Physician or dentist • **Emergency room setting** ○ Emergency Medicine Physicians and credentialed APPs

Advocate Health Care. *Procedural Sedation Policy– Wisconsin Division*. 2024

Advocate Health Care. *Procedural Sedation: Adult, Pediatric, Neonatal Policy – Illinois Division*. 2025

Atrium Health Care. *Policy and clinical practice guidelines for procedural sedation in adult and pediatric patients*. 2022

Advocate Health Care. *Moderate and deep sedation in adult and pediatric patients for emergency physicians and pediatric emergency physicians in emergency departments- Greater Charlotte Market*. 2025

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Roles and Responsibilities of Personnel During Moderate Sedation

Advocate Health Midwest- Wisconsin and Illinois Procedural Sedation Policies	Advocate Health Southeast- ED Sedation Policy	Advocate Health Southeast- Procedural Sedation Policy

• **Physician**
  ○ Pre-procedural Assessment
  ○ ASA physical status classification
  ○ Airway evaluation
  ○ Plan for sedation
  ○ History of anesthesia/sedation issue
• **Registered Nurse**
  ○ Past Medical History
  ○ Physical Assessment
	• **Emergency Medicine Practitioner**
	  • Directs and is responsible for Pre-, Intra-, and Post-Anesthetic patient care during procedural sedation.
	  • may not simultaneously serve as the person monitoring the patient
	• **Registered Nurse**
	  ○ Medication administration
	  ○ Assess patient response to sedation Complete procedural (pre, intra, and post) documentation
	  ○ Remain with patient until patient returns to baseline
	• **Respiratory Therapy (RT) or ED Paramedic**
	  ○ Monitor airway
	  ○ Assist with management of airway under direction of practitioner
		• **Practitioner**
		  • Directs and is responsible for Pre-, Intra-, and Post-Anesthetic patient care during procedural sedation.
		  • may not simultaneously serve as the person monitoring the patient.
		  • Rescue patient whose level of sedation becomes deeper than initially intended
		• **Monitor**
		  • SaO2 (SpO2 via pulse oximetry), BP, HR & rhythm, RR, and (LOC) continuously throughout the case with documentation at a minimum of every five (5) minutes

Advocate Health Care. *Procedural Sedation Policy– Wisconsin Division*. 2024
Advocate Health Care. *Procedural Sedation: Adult, Pediatric, Neonatal Policy – Illinois Division*. 2025
Atrium Health Care. *Policy and clinical practice guidelines for procedural sedation in adult and pediatric patients*. 2022
Advocate Health Care. *Moderate and deep sedation in adult and pediatric patients for emergency physicians and pediatric emergency physicians in emergency departments- Greater Charlotte Market.* 2025

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Supporting Personnel for Procedural Sedation

Team Member	Role
Nurse	Procedural preparation, medication administration, patient monitoring, establish IV access
Pharmacist	Appropriate medication selection, dosing, preparing medications, medication administration if certified
Respiratory Therapist	Airway management, oxygen delivery, ventilation support, monitoring, respiratory equipment

Guideline for the Diagnosis and Management of AFib. ACC/AHA/ACCP/HRS. 2023

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Workflow of a Cardioversion

- Determine indication and plan of care
- Informed consent
- Pre-procedure assessment
  - Anticoagulation status
  - Electrolytes
  - EKG
- Prepare equipment
- Provide medications
- Charge device and deliver shock
- Patient monitoring

Guideline for the Diagnosis and Management of AFib. ACC/AHA/ACCP/HRS. 2023

Workflow of a Cardioversion- SOAP ME

	Denotation	Supplies and Equipment
S	Suction	Yankauer-type with suction source
O	Oxygen	Delivery devices (e.g., nasal cannula, facemask), oxygen flow meter, oxygen tubing, oxygen source (tank or pipeline supply)
A	Airway	Bag-valve mask, oral and nasal airways, lubricant, tested laryngoscope with blades, endotracheal tubes, stylet
P	Pharmacy	Medications for the procedure, pharmacologic antagonists if appropriate (e.g., flumazenil, naloxone), advanced life-support medications, medications to treat acute anaphylaxis (e.g., epinephrine), crystalloid i.v. fluids
M	Monitors	Pulse oximeter, noninvasive blood pressure cuff device, capnometer, electrocardiograph
E	Equipment	Gloves, alcohol pads, syringes, needles, timing device, defibrillator, procedure-specific supplies (e.g., splints, sutures)

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Pharmacists' role in procedural sedation and analgesia in the emergency department Am J Health Syst Pharm. 2012

Role of a Pharmacist

- Agent selection
- Discuss pharmacologic plan
- Obtain medication, syringes, needles, alcohol swabs, vials, antidotes
- Provide Medications
  - May administer medications per 2015 Wisconsin Act 290
  - Check state regulations or site specific policy
- Patient monitoring

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Pharmacists' role in procedural sedation and analgesia in the emergency department Am J Health Syst Pharm. 2012

Assessment Question #2

During procedural sedation for electrical cardioversion, which of the following is true per the 2024 ACEP Guidelines on unscheduled procedural sedation?

a. Only one trained licensed health care practitioners is required to be at bedside

b. A pharmacist must lead the cardioversion

c. A minimum of two trained licensed health care practitioners are required to be at bedside, one as the sedation provider and one as the sedation monitor

d. Per the guidelines, an anesthesiologist must be present when performing sedation for a cardioversion in the emergency department.

Objective: Assess specific factors to determine the most appropriate sedative agent for cardioversion

Pharmacotherapy

- Types of Sedation
- Medication Profiles
- Patient-Population Specific Considerations

Types of Sedation

Sedation Type	Definition & Responsiveness	Amnesia	Cardiac Function	Airway	Spontaneous Ventilation
Minimal	Drug-induced state with normal response to verbal commands	No	Unaffected	Unaffected / Maintained	Unaffected / Maintained
Moderate	Drug-induced depression of consciousness with response to verbal commands or tactile stimulation	Frequently	Usually Maintained	Adequate	Adequate
Deep	Drug-induced depression of consciousness that cannot be easily aroused with stimuli	Profound	Usually Maintained	Intervention may be required	Likely inadequate
General Anesthesia	Drug-induced depression of consciousness, unarousable	Profound	Potentially impaired	Intervention often required	Often inadequate
Dissociative	Trance-like cataleptic state	Profound	Retention	Retention	Retention

Green S et al. *Ann Emerg Med*. 2019
Godwin S et al. *Ann Emerg Med*. 2014

Types of Sedation

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= our focus ★ *= procedural sedation*

Green S et al. *Ann Emerg Med*. 2019
Godwin S et al. *Ann Emerg Med*. 2014

Sedative Agents

- Propofol
- Etomidate
- Methohexital

General Prevalence of Sedation Use

Insight on the average amount of IV bolus administrations of Propofol, Etomidate, and Methohexital amongst Advocate Health Midwest hospitals from May 2025 to November 2025

Propofol	Etomidate	Methohexital
~320,000	~4,700	~2,200

*Southeast region data is not accessible to Midwest residents

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Propofol

- Sedative hypnotic with general anesthetic properties

- Mechanism of Action:
  - Agonism of $GABA_A$ receptors
  - Inhibition of NMDA receptors

- Procedural Sedation Dose:
  - Adults: 1 to 2 mg/kg IV bolus

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Propofol. Medication Guide. *FDA*. 2022.

Propofol

Pharmacokinetics

- Highly lipophilic
- Rapid onset: ~30 seconds
- Duration: 3 to 10 minutes
- Biphasic half-life

Analgesia	Amnesia	Sedation
✗	✓	✓

Adverse Effects

- Hypotension
- Hypersensitivity
- Respiratory depression

Patient-Population Specific Considerations

FOR PROPOFOL

Patient Specific Consideration
Hypersensitivity

- The manufacturer lists known hypersensitivity to propofol, egg, or soybean as a contraindication for use
- Literature suggests that patients with egg/soybean allergy ***does not significantly increase the relative risk*** of allergic reactions with propofol use
- Per AAAAI guidelines, patients with a soy or egg allergy can receive propofol **without** any special precautions

Propofol: Package Insert / Prescribing Info. *Drugs.com*. 2024

Iwakiri M et al., *PubMed*. 2023
Soybean and Egg Allergy. *AAAAI*. 2022
Asserhoj L et al., *British Journal of Anaesthesia*. 2016

Patient Specific Consideration
Hypotension

Propofol may cause severe hypotension, ***to the effect of ≥30% decrease in MAP***

Pathophysiology is not completely understood

- May involve several mechanisms
  - ↓ preload, afterload, and contractility
  - ↑ peripheral vasodilation
  - Inhibition of sympathetic nervous system outflow & impairing baroreflex regulatory mechanisms

- Mitigate with the use of push dose vasopressors
  - Phenylephrine 100mcg
  - Epinephrine 5-20mcg

Nam E et al., *Clinical Key*. 2022
Singer S et al., *Clinical Key*. 2022
Ebert T et al., *Anesthesiology*. 1992
Tobias J et al., SJA. 2011

Population Specific Consideration
Chronic Alcoholism

Chronic alcohol users may require larger doses of propofol to induce sedation

<u>Hypothesized Pathophysiology</u>

- Cross Tolerance
  - Constant ↑ inhibitory effects on neurons lead to neuroadaptation and tolerance to other GABAergic drugs

- Changes in Liver Solubility
  - Alcohol can alter lipid metabolism and fatty infiltration

Long-Term Alcohol Use. *Connecticut Anesthesia Assoc*. 2024
Fassoulaki, A et al., *Anesthesia & Analgesia*. 1993
Fassoulaki, A et al. *British Journal of Anaesthesia*. 1986
Servin F et al., *Anesthesiology*. 2003

Population Specific Consideration
Biological Red Hair Color

- Some evidence suggests that women with red hair may have altered responsiveness to hypnotics and may require larger doses to induce an effect
- Linked to variants of the melanocortin-1 receptor (MC1R) gene, normally responsible for regulating the pigmentation of skin and hair color
- Conflicting evidence; most studies focus on the phenotype and show no statistically significant association between hair color and propofol pharmacokinetics or pharmacodynamics

Augustinsson A et al., *Journal of Personalized Medicine*. 2024
Liem E et al., *Anesthesiology*. 2004
Myles PS et al., *Anaesthesia and Intensive Care*. 2012
Doufus A et al., *Anesthesia & Analgesia*. 2013
Lichtenwalter K. *Pain*. 2021

Population Specific Consideration
Elderly Patients

Elderly patients ≥65 years old are more susceptible to adverse effects associated with propofol

- Higher prevalence of respiratory depression, apnea, and the need for clinical intervention with the use of propofol in the elderly

- Administering smaller propofol IV bolus doses of 0.5 mg/kg and subsequent boluses of 0.25 mg/kg may limit both respiratory and cardiovascular complications

Krauss B et al., *Ann Emerg Med*. 2016
Homfray G et al., *British Journal of Anaesthesia*. 2018

Etomidate

- Nonbarbiturate, sedative hypnotic with general anesthetic properties

- Mechanism of Action:
  - Agonism of $GABA_A$ receptors

- Procedural Sedation Dose:
  - Adults: 0.1 to 0.2 mg/kg IV bolus

Etomidate. Medication Guide. *FDA*. 2022

Etomidate

Pharmacokinetics

- Onset IV: ~30 to 60 seconds
- Duration: ~5 to 15 minutes
- Limited effects on cardiovascular and hemodynamic function

Analgesia	Amnesia	Sedation
✗	✓	✓

Adverse Effects

- Myoclonus
- Adrenal suppression
- Respiratory depression

Patient-Population Specific Considerations

FOR ETOMIDATE

Patient Specific Consideration
History of Seizures

Etomidate may cause myoclonic jerking 30-60% of the time upon administration

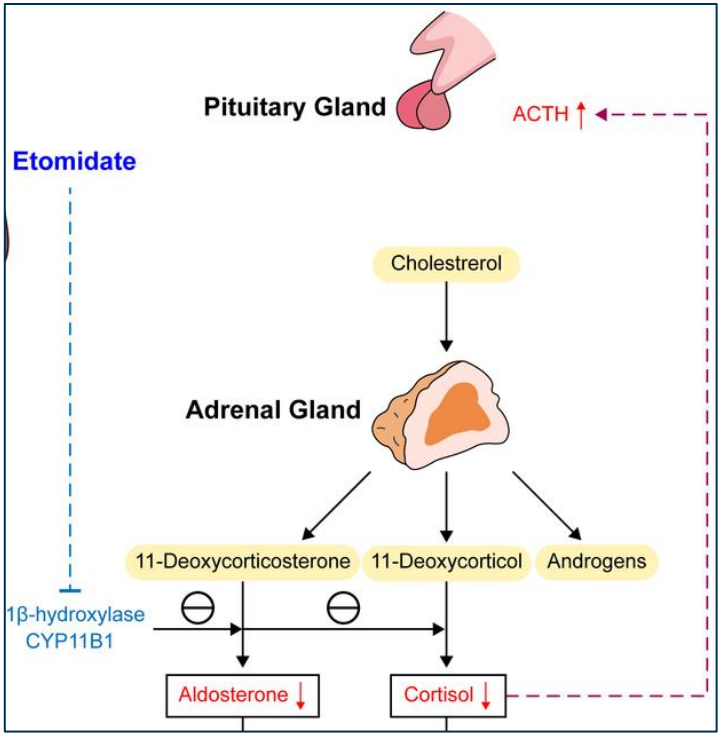
- Hypothesized pathophysiology is likely due to disinhibition of extrapyramidal motor activity and cortical activity
- May increase epileptiform spikes on EEG
- Minimal and conflicting evidence supporting the risk of etomidate precipitating a seizure; the risk remains unknown

Etomidate. Medication Guide. *FDA*. 2022
Barrie M et al., *AMP EM*. 2016
Etomidate for RSI: Seizure Considerations. Pharmacy Pearls

Patient Specific Consideration
Adrenal Insufficiency

Avoid etomidate in patients with adrenal insufficiency

- Doses of 0.3 mg/kg have shown to reduce plasma cortisol and aldosterone levels
- Inhibits the function of the enzyme 11-β hydroxylase in adrenal cortex
- Temporary inhibition; persists for ~6 to 8 hours



Wu W, Xia C, Gan L, Liao S. *Etomidate Induced Adrenal Insufficiency*.; 2024.

Etomidate. Medication Guide. *FDA*. 2022
Albert SG et al., *Journal of Intensive Care Medicine*. 2020
Tobias J et al., SJA. 2011

Methohexital

- Barbiturate anesthetic

- Mechanism of Action:
  - Agonism of $GABA_A$ receptors

- Procedural Sedation Dose:
  - Adults: 0.75 to 1 mg/kg IV bolus; may re-dose with 0.5 mg/kg every 2 to 5 minutes based on response and tolerability

Methohexital. Medication Guide. *FDA*
Syed Q et al., PubMed. 2023

Methohexital

Pharmacokinetics

- Lipophilic
- Onset IV: ~30 seconds
- Duration: 5 to 15 minutes

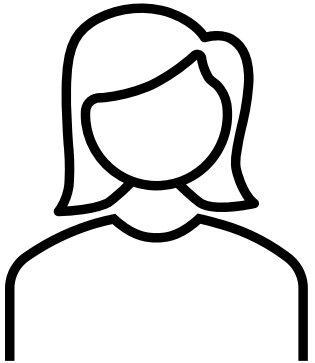
Analgesia	Amnesia	Sedation
✗	✓	✓

Adverse Effects

- Hiccups
- Cough
- Laryngospasm
- Respiratory depression
- Apnea
- Twitching

Back to A.J.

New vitals were taken, and A.J. has provided the emergency department staff with some past medical and social history.



Features: Female, Caucasian race, brown hair, brown eyes

PMH: HFpEF (EF from 12/28/25 was 61%), GERD, OSA

Medications: empagliflozin 10mg daily, pantoprazole 40mg daily

Allergies: egg allergy (anaphylaxis)

Social History: Consumes 5-10 beers with dinner, never smoked

Current Vitals: BP: 90/85 mmHg; HR 187 beats per minute; SpO_2 99% on 2L NC; RR: 19 breaths per minute; Wt: 120kg; Ht: 162cm

Assessment Question #3

After consulting with the EP team, the ED physicians determined that the patient was a candidate for DCCV. Based on the patient's characteristics, hemodynamic status and past medical history, which sedative agent would be the most appropriate? (Wt: 120kg)

a. Propofol 60mg IV bolus
b. Propofol 120mg IV bolus
c. Etomidate 12mg IV bolus
d. Methohexital 70 mg IV bolus

Literature Analysis on Efficacy

- Differences in Efficacy amongst Sedative Agents Discussed

Propofol vs. Etomidate

Study	Methods / Outcome Measures	Results

Cardioversion: What to choose? Etomidate or Propofol (2015)	**Methods:** Single centered, prospective, randomized, single blind trial
	
	Objective: To compare propofol and etomidate as sedative agents during cardioversion
	
	Eligible Population:
	- Included 60 patients of >18 years age, belonging to ASA I/II/III grade with ejection fraction >35% and undergoing elective EC.
	  - 30 patients received 1mg/kg IV bolus propofol with fentanyl
	  - 30 patients received 0.1mg/kg IV bolus etomidate with fentanyl
		• **Incidence of hypotension (p= 0.233)**
		  ○ **Propofol**: 33.3%
		  ○ **Etomidate**: 16.6%
		• **Incidence of respiratory depression (p=0.024)**
		  ○ **Propofol**: 20%
		  ○ **Etomidate**: 0%
		• **Diastolic blood pressure (p= 0.032)**
		  ○ **Etomidate**: 68.90 ± 11.54mm
		  ○ **Propofol**: 62.87 ± 9.68 mmHg
		
		• **Myoclonus** was prevalent in the etomidate vs propofol group (26.6% vs. 0%, p= 0.004)
		
		• **Mean left atrial size** (p=0.006)
		  ○ **Propofol**: 35.967 ± 8.74 mm
		  ○ **Etomidate**: 42.633 ± 9.40 mm
		
		• **Cardioversion success rate** (p=0.739)
		  ○ **Propofol**: 80%
		  ○ **Etomidate**: 83.35%
		
		• **Time required to achieve RSS = 2** was higher in the propofol group (659.1 + 150.7 vs. 435.7 + 148.06 seconds, P < 0.001) **denoting early recovery with etomidate**

Main Takeaway: Both sedative agents provide adequate sedation for cardioversion but differ in adverse effects and recovery time.

Desai PM, Kane D, Sarkar MS. Cardioversion: What to choose? Etomidate or propofol. Ann Card Anaesth. 2015

Propofol vs. Etomidate

Study	Methods / Outcome Measures	Results
Etomidate vs. Propofol for Procedural Sedation in the Emergency Department (2007)	**Methods:** RCT, non-blinded prospective trial of adults undergoing painful procedures in the ED, requiring procedural sedation with either propofol or etomidate. **Objective:** To compare the efficacy, adverse effects and recovery duration between etomidate and propofol when using in the ED. **Population:** • Etomidate=105 (mean total dose: 0.26 mg/ kg) • Propofol=109 (mean total dose: 1.8 mg/kg) • Total =214	**Procedural Success** [difference: -7.4; 95% CI (-14.3 to -1.1)] • Etomidate: 89.5% • Propofol: 97.2% **Subclinical Respiratory Depression** [difference –7.9%; 95% CI (-20.9 to 5.1)] • Etomidate: 34.3% • Propofol: 42.2% **Myoclonus** [difference: 18.2%; 95% CI (10.1 to 26.2)] • Etomidate: 20% • Propofol:1.8% **Mean SBP:** [difference: 8.7mmHg (95% CI: 3.7 To 13.6)] • Etomidate: 129.6 • Propofol: 120.9 **Mean Recovery Time:** [difference: 2 minutes (95% CI (0.4 to 3.6)] • Etomidate: 8.8 minutes • Propofol : 6.8 minutes

Main Takeaway: Both sedative agents provide adequate sedation for cardioversion but differ in adverse effects and recovery time.

Miner JR, Danahy M, Moch A, Biros M. Randomized clinical trial of etomidate versus propofol for procedural sedation in the emergency department. *Ann Emerg Med*. 2007

Methohexital vs. Propofol vs. Etomidate

Study	Methods / Outcome Measures	Results

Methohexital for procedural sedation of cardioversions in the emergency department (2022)	**Methods**: A single-center, retrospective study of adult patients who underwent procedural sedation for electrical cardioversion in the ED
	
	Objective: To compare the use of methohexital to propofol and etomidate for procedural sedation for electrical cardioversions in the ED.
	
	Population:
	• Methohexital= 50 (mean cumulative dose: 73.3 ± 29.7 mg)
	• Propofol= 50 (mean cumulative dose: 78.5 ± 15.4 mg)
	• Etomidate= 50 (mean cumulative dose: 14.9 ± 6.8 mg)
	• Total= 150
		Primary Objective: Time from dose sedative to goal Aldrete score *(p= 0.863)*
		• **Methohexital**: 10.5 minutes (7-18.5 minutes)
		• **Propofol**: 12 minutes (9-16.8 minutes)
		• **Etomidate**: 11 minutes (8-15 minutes)
		
		Secondary Objectives:
		• Time from first sedative agent to discharge from the ED (p = 0.897)
		  ○ **Methohexital**: 90.3 ± 40.3 min
		  ○ **Propofol**: 89 ± 57.4 min
		  ○ **Etomidate**: 94 ± 42.5 min
		• Mean change in SBP (mmHg) (p = 0.0001).
		  ○ **Methohexital**: −9.2 ± 25.5 mmHg
		  ○ **Propofol**: −21.7 ± 25.1 mmHg
		  ○ **Etomidate** +1.88 ± 20.9 mmHg

Main Takeaway: Methohexital was found to have a similar efficacy and safety when compared to propofol and etomidate.

Bauer J, Beauchamp L, Pavich E. Methohexital for procedural sedation of cardioversions in the emergency department. *Am J Emerg Med*. 2022

Assessment Question #4

If etomidate is unavailable for use in A.J.'s procedural sedation during electrical cardioversion, which of the following statements about administering propofol would be considered true based on her clinical patient-specific factors?

a. Her egg allergy should be considered an absolute contraindication, and therefore special precautions should be taken with administration

b. Phenylephrine 100 mcg IV push may be administered to mitigate arterial hypotension

c. Her brown hair may cause altered responsiveness to hypnotics, requiring larger doses

d. Her chronic alcohol use may decrease liver solubility of propofol, requiring lower doses

Summary

- Clinical scenarios where cardioversion are indicated are usually patients with hemodynamic instability or patients with atrial fibrillation
- A minimum of two health care professionals must be present during a cardioversion
- Many patient specific factors can affect what sedation agent we use
- Current literature has identified propofol, etomidate, and methohexital have similar safety and efficacy for sedation

References

1. Joglar, J. A., Chung, M. K., Armbruster, A. Et At. (2023). 2023 ACC/AHA/ACCP/HRS guideline for the diagnosis and management of atrial fibrillation: A report of the American College of Cardiology/American Heart Association Joint Committee on clinical practice guidelines. *Circulation*, *149*(1). https://doi.org/10.1161/CIR.0000000000001193
2. Miller A. HHW Cardioversion. *Alex's Asteroid Astrology.* 2020 https://alexasteroidastrology.com/astrology-of-cardioversion-and-basement-flood/front-view-of-male-figure-a-with-cardioversion-pads-diagram-of-electrocardiography-graphs-showing-an-irregular-heart-rhythm-and-a-regular-heart-rhythm/.
3. Cardioversion and defibrillation for specific arrhythmias. *UpToDate*. (2025). Uptodate.com. https://www.uptodate.com/contents/cardioversion-and-defibrillation-for-specific-arrhythmias
4. Algorithms. *2025 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. 2025. https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines/algorithms.
5. Kornej, J., Börschel, C. S., Benjamin, E. J., & Schnabel, R. B. (2020). Epidemiology of Atrial Fibrillation in the 21st Century: Novel Methods and New Insights. *Circulation research*, *127*(1), 4–20. https://doi.org/10.1161/CIRCRESAHA.120.316340
6. Klein, H. H., & Trappe, H. J. (2015). Cardioversion in Non-Valvular Atrial Fibrillation. *Deutsches Arzteblatt international*, *112*(50), 856–862. https://doi.org/10.3238/arztebl.2015.0856
7. Green SM, Roback MG, Krauss BS, et al. Unscheduled procedural sedation: A multidisciplinary consensus practice guideline. *Annals of Emergency Medicine*. 2024;73(5).
8. Procedural sedation in adults in the emergency department: General considerations, preparation, monitoring, and mitigating complications. 2025. UpToDate. Procedural sedation in adults in the emergency department: General considerations, preparation, monitoring, and mitigating complications - UpToDate
9. Advocate Health Care. *Procedural Sedation Policy– Wisconsin Division*. PolicyTech document ID 23118. 2024
10. Advocate Health Care. *Procedural Sedation: Adult, Pediatric, Neonatal Policy – Illinois Division*. PolicyTech document ID 7252. 2025
11. Atrium Health Care. *Policy and clinical practice guidelines for procedural sedation in adult and pediatric patients*. 2022
12. Advocate Health Care. *Moderate and deep sedation in adult and pediatric patients for emergency physicians and pediatric emergency physicians in emergency departments- Greater Charlotte Market.* 2025
13. Patanwala AE, Thomas MC, Casanova TJ, Thomas R. Pharmacists' role in procedural sedation and analgesia in the emergency department. *Am J Health Syst Pharm*. 2012;69(15):1336-1342. doi:10.2146/ajhp110707

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References

1. Godwin SA, Caro DA, Wolf SJ, et al. Clinical policy: Procedural sedation and analgesia in the emergency department. *Annals of Emergency Medicine*. 2005;45(2):177-196. doi:https://doi.org/10.1016/j.annemergmed.2004.11.002
2. Masaki Iwakiri, Inoue R, Uchida K. Allergic reactions to propofol in adult patients with egg or soybean allergy: a retrospective cohort study from a large database of a single institute. *JA Clin Rep.* 2023;9(1). doi.org/10.1186/s40981-022-00591-8
3. Soy-allergic and Egg-allergic can Receive Anesthesia | AAAAI. Aaaai.org. Published 2022. https://www.aaaai.org/Tools-for-the-Public/Conditions-Library/Allergies/soy-egg-anesthesia
4. Asserhøj LL, Mosbech H, Krøigaard M, Garvey LH. *No evidence for contraindications to the use of propofol in adults allergic to egg, soy or peanut†. British Journal of Anaesthesia. 2016;116(1):77-82. https://doi.org/10.1093/bja/aev360*
5. Nam E, Fitter S, Moussavi K. Comparison of push-dose phenylephrine and epinephrine in the emergency department. *The American Journal of Emergency Medicine*. 2022;52:43-49. doi.org/10.1016/j.ajem.2021.11.033
6. Singer S, Pope H, Fuller BM, Gibson G. The safety and efficacy of push dose vasopressors in critically ill adults. *The American Journal of Emergency Medicine*. 2022;61:137-142. doi.org/10.1016/j.ajem.2022.08.055
7. Ebert Thomas J, Muzi M, Berens R, Goff D, Kampine John P. Sympathetic responses to induction of anesthesia in humans with propofol or etomidate. *Anesthesiology*. 1992;76(5):725-733. doi.org/10.1097/00000542-199205000-00010
8. Tobias J, Leder M. Procedural sedation: A review of sedative agents, monitoring, and management of complications. *Saudi Journal of Anaesthesia*. 2011;5(4):395. doi.org/10.4103/1658-354x.87270
9. The effect of long-term alcohol use on propofol. *Connecticut Anesthesia Associates.* 2024. https://ctanesth.com/effect-long-term-alcohol-use-propofol/
10. Fassoulaki, Argyro MD, PhD, DEAA; Farinotti, Robert PhD; Servin, Frédérique MD; Desmonts, Jean Marie MD. Chronic alcoholism increases the induction dose of propofol in humans. *Anesthesia & Analgesia* 77(3):p 553-556, September 1993.
11. Fassoulaki A, Eger EI. Alcohol increases the solubility of anaesthetics in the liver. *British Journal of Anaesthesia*. 2017;58(5):551-554. doi.org/10.1093/bja/58.5.551
12. Liang C, Chen J, Gu W, Wang H, Xue Z. Chronic alcoholism increases the induction dose of propofol. *Acta Anaesthesiologica Scandinavica*. 2011;55(9):1113-1117. doi.org/10.1111/j.1399-6576.2011.02497.x
13. Servin Frédérique S, Bougeois B, Gomeni R, Mentré F, Farinotti R, Desmonts JM. Pharmacokinetics of propofol administered by target-controlled infusion to alcoholic patients. *Anesthesiology*. 2003;99(3):576-585. doi.org/10.1097/00000542-200309000-00012
14. Augustinsson A, Franze E, Almqvist M, Warrén Stomberg M, Sjöberg C, Jildenstål P. Red-haired people's altered responsiveness to pain, analgesics, and hypnotics: myth or fact?—a narrative review. *Journal of Personalized Medicine*. 2024;14(6):583. doi.org/10.3390/jpm14060583

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References

1. Liem Edwin B, Lin CM, Suleman MI, et al. Anesthetic Requirement Is Increased in Redheads. *Anesthesiology*. 2004;101(2):279-283. doi:https://doi.org/10.1097/00000542-200408000-00006
2. Myles PS, Buchanan FF, Bain CR. The Effect of Hair Colour on Anaesthetic Requirements and Recovery Time after Surgery. *Anaesthesia and Intensive Care*. 2012;40(4):683-689. doi:https://doi.org/10.1177/0310057x1204000415
3. Doufas AG, Orhan-Sungur M, Komatsu R, et al. Bispectral index dynamics during propofol hypnosis is similar in red-haired and dark-haired subjects. *Anesthesia & Analgesia*. 2013;116(2):319-326. https://doi.org/10.1213/ane.0b013e31827533b4
4. Zorina-Lichtenwalter K, Maixner W, Diatchenko L. Detangling red hair from pain: phenotype-specific contributions from different genetic variants in melanocortin-1 receptor. *Pain*. 2019;161(5):938-948. https://doi.org/10.1097/j.pain.0000000000001780
5. Homfray G, Palmer A, Grimsmo-Powney H, Appelboam A, Lloyd G. Procedural sedation of elderly patients by emergency physicians: a safety analysis of 740 patients. *British Journal of Anaesthesia*. 2018;121(6):1236-1241. https://doi.org/10.1016/j.bja.2018.07.038
6. Krauss BS, Andolfatto G, Krauss BA, Mieloszyk RJ, Monuteaux MC. Characteristics of and Predictors for Apnea and Clinical Interventions During Procedural Sedation. *Annals of Emergency Medicine*. 2016;68(5):564-573. https://doi.org/10.1016/j.annemergmed.2016.07.010
7. Syed Q, Kohli A. Methohexital. Nih.gov. Published July 10, 2023. Accessed December 29, 2025. https://www.ncbi.nlm.nih.gov/books/NBK544291/&lang=en/
8. *Etomidate for RSI: Seizure Considerations*. Accessed December 29, 2025. https://pharmacyacute.com/wp-content/uploads/2023/02/Etomidate-for-Induction-and-seizure-pharmacy-friday-Copy.pdf
9. Adams Z, Barrie M, Rozycki E. Etomidate for RSI in the Seizing Patient. AMP EM. Published April 21, 2016. Accessed December 29, 2025. https://osuemed.wordpress.com/2016/04/21/etomidate-for-rsi-in-the-seizing-patient
10. Albert SG, Sitaula S. Etomidate, adrenal insufficiency and mortality associated with severity of illness: a meta-analysis. *Journal of Intensive Care Medicine*. 2020;36(10):1124-1129. https://doi.org/10.1177/0885066620957596.
11. *AMIDATE ® (Etomidate)* . https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/018227s032lbl.pdf
12. *BREVITAL ® (Methohexital Sodium).* https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/011559s051lbl.pdf
13. DIPRIVAN® (propofol*).* https://www.accessdata.fda.gov/drugsatfda_docs/label/2022/019627s069lbl.pdf
14. Desai PM, Kane D, Sarkar MS. Cardioversion: what to choose? etomidate or propofol. *Ann Card Anaesthesia* 2015;18(3):306-311. doi:10.4103/0971-9784.159798
15. Miner JR, Danahy M, Moch A, Biros M. Randomized clinical trial of etomidate versus propofol for procedural sedation in the emergency department. *Ann Emerg Med.* 2007;49(1):15-22. doi:10.1016/j.annemergmed.2006.06.042
16. Bauer J, Beauchamp L, Pavich E. Methohexital for procedural sedation of cardioversions in the emergency department. *Am J Emerg Med*. 2022;58:79-83. doi:10.1016/j.ajem.2022.05.036

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