

SAN JOAQUIN COUNTY
EMERGENCY MEDICAL SERVICES AGENCY

TITLE: MONITORING AN INTRAVENOUS INFUSION OF NITROGLYCERIN EMS Policy No. 5955

PURPOSE: The purpose of this policy is to authorize paramedics to monitor and adjust intravenous nitroglycerin (NTG) infusions in adult patients during interfacility transport.

AUTHORITY: Health and Safety Code, Division 2.5, Sections 1797.220 & 1797.221;
Title 22 California Code of Regulation, Division 9, Section 100144.

POLICY:

- I. Only those ALS Ambulance providers approved by the San Joaquin County EMS Agency are permitted to provide the service of monitoring nitroglycerin infusions during interfacility transports from approved hospital(s) within their service area.
- II. Only those paramedics who have successfully completed a training program(s) approved by the San Joaquin County EMS Agency on nitroglycerin infusions will be permitted to monitor and adjust them during interfacility transports. Training must include the use of mechanical infusion pumps.
- III. Patients that are candidates for paramedic transport will have preexisting nitroglycerin drips infusing into peripheral lines. Prehospital personnel will not initiate nitroglycerin drips.
- IV. Paramedics may restart nitroglycerin infusions if the nitroglycerin infusion is interrupted due to infiltration, accidental disconnection of the IV line, malfunctioning pump, etc. All lines must be restarted in accordance with the transferring physician's orders. Paramedics will ensure new IV line is patent prior to restarting the infusion.
- V. Nitroglycerin Infusions
The following parameters shall apply in all cases where paramedics transport patients with preexisting nitroglycerin drips:
 - A. Patient shall be placed on cardiac, blood pressure and pulse oximetry monitors and monitored continuously during transport.
 - B. Signed transfer orders from the transferring physician must be obtained prior to transport. Transfer orders must certify that the patient is stable for transfer and provide orders for maintaining the nitroglycerin infusion during transport.
 - C. Nitroglycerin infusions must be regulated by a mechanical intravenous

Effective: **JANUARY 1, 2007**
Revised:
Supersedes: 530.15

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infusion pump. If pump failure occurs and cannot be corrected, the paramedic will stop the nitroglycerin infusion and notify the transferring hospital.

- D. Infusion fluid shall be D5W or NS.
- E. Nitroglycerin infusion concentration shall be 25 mg/250 ml or 50 mg/250 ml.
- F. Regulation of the drip rate will be within parameters as defined by the transferring physician, but in no case will changes be in greater than 5 mcg/minute increments every 10 minutes.
- G. In cases of hypotension (SBP < 90), the medication drip will be discontinued and the transferring hospital and base hospital will be notified.
- H. Maximum drip rate shall not exceed 200 mcg per minute.
- I. Vital signs shall be monitored and documented every 10 minutes during transport or every 5 minutes if an increase in the drip rate is ordered by the base physician.

VI. Continuous Quality Improvement

All calls involving the transfer of patients with preexisting nitroglycerin infusions shall be reviewed through the ambulance provider's CQI program to determine compliance with policy and transferring physician orders. Reports of audits will be submitted to the EMS agency on request.

VII. General Information on Nitroglycerin

- A. Nitroglycerin is a vasodilating agent that belongs to a group of drugs referred to as nitrates. Nitroglycerin acts to: relax vascular smooth muscle; vasodilate both arteries and veins (especially veins); increase venous pooling; decrease venous return to the heart; increase arterial relaxation; decrease systemic vascular resistance; decrease cardiac workload; decrease cardiac oxygen consumption; dilate the large epicardial arteries; and lower diastolic more than systolic blood pressure.
- B. Pharmacokinetics:
 - 1. SL: Onset 1-3 minutes; duration 30 minutes;
 - 2. Transdermal (patch): Onset 0.5 - 1 hour; duration 12-24 hours;
 - 3. Transdermal (ointment): Onset 0.5-1 hour; duration 2-12 hours;

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4. PO (sustained release): Onset 20-40 minutes; duration 3-8 hours;
 5. IV: Onset usually immediate; duration is variable;
 6. Metabolized by the liver;
 7. Excreted in urine;
 8. Half-life of 1-4 minutes.
- C. Indications for the use of Nitroglycerin:
1. Sublingual:
 - a. Relief of acute anginal pain or related ischemic symptoms;
 - b. Congestive Heart Failure (CHF) to decrease myocardial workload.
 2. Intravenous:
 - a. Diagnosed MI or unstable angina pectoris, even in the absence of chest pain, to decrease myocardial workload;
 - b. Relief of persistent ischemic chest pain that does not respond to other medications;
 - c. Hypertension when associated with diagnosed MI or unstable angina pectoris (not used solely for blood pressure control).
- D. Contraindications:
1. Allergy to nitrates;
 2. Increased intracerebral pressure such as in cases of stroke, head trauma or intracerebral bleeding;
 3. Hypotension;
 4. Hypovolemia;
 5. Treatment of hypertension without progressively worsening signs of organ damage, ischemia or neurologic deficit.
- E. Precautions:
1. Pregnancy (class C);
 2. Glaucoma patients (can increase intraocular pressure);
 3. Lactation (fetal effects in animal studies);
 4. May require decreased dosing in patients with liver disease.
- F. Adverse Effects:
1. Hypotension;
 2. Headache (from vasodilation);
 3. Dizziness and syncope (from hypotension);

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4. Nausea/Vomiting;
 5. Tachycardia (in response to hypotension);
 6. Paradoxical bradycardia (in rare instances);
 7. Pallor, sweating (from hypotension);
 8. Flushing, sweating (from vasodilation);
 9. Rash, if allergic to nitrates.
- G. Interactions:
1. Alcohol - combined with nitroglycerin can worsen hypotension;
 2. Aspirin - can increase serum nitrate concentrations;
 3. Calcium channel blockers - combined with nitroglycerin can worsen orthostatic hypotension;
 4. β -blockers, diuretics, anti-hypertensives - can increase actions of nitroglycerin.
- H. Standard Dosages for Nitroglycerin drips:
1. For diagnosed patients with ischemic symptoms:
 - a. Continuous IV Infusion: starting at 10-20 mcg/min and increased by 5 or 10 mcg/min every 5 to 10 minutes until the desired hemodynamic or clinical response is achieved. Most patients respond to 50 to 200 mcg/minute and the lowest possible dose should be used. When indicated, rates should be decreased in 10 minute intervals.
- I. Special Considerations:
1. Glass infusion bottles and non-polyvinyl tubing must be used as plastics will absorb nitroglycerin and alter the dose administered.
 2. Do not use in-line filters.
 3. Attach drip to port closest to catheter insertion.

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