

# Mobile Intensive Care Unit (M.I.C.U.) Treatment Protocols

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**9-00**

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## MICU Program Policy

This Paramedic MICU program policy is designed to provide a higher level of care for interfacility patient transports than possible under Protocol I-12 (Interhospital Patient Transfers). It applies to ground interfacility transports that originate at or end in the Washtenaw/Livingston Medical Control Authority.

### I Program Policy

1. MICU medical director is appointed by the EMS medical director (See MICU medical director Roles/Responsibilities).
2. MICU Supervisor
  1. Each participating service will have a designated MICU Supervisor.
  2. MICU trained EMT-P with 2 years full time MICU experience
  3. Approval of MICU medical director
3. MICU Course Instructor
  1. Provides initial training
  2. Licensed paramedic instructor-coordinator
  3. Approved by the MICU medical director and MICU supervisor
4. MICU Paramedic
  1. Paramedic currently licensed by the MDCIS
  2. Employed by an approved ALS provider
  3. Successfully completed an approved MICU training program
  4. Participated in MICU continuing education and recertification as required by the MICU medical director.
  5. Cleared MICU paramedics are known as Senior MICU Paramedics. Paramedics who have completed the MICU training but have not been cleared to work independently are known as MICU Paramedics.

### II Agency Requirements

1. MICU supervisor, medical director, MICU Training, MICU equipment and personnel are to be provided for and maintained by the agency.
2. Provide staffing as follows:
  1. MICU staffed with two Senior MICU paramedics, one Senior MICU paramedic and one MICU paramedic, or one senior MICU paramedic and one paramedic with individual call approval of the MICU medical director.
3. Maintain accurate records of personnel licensure, MICU training and clearance status including completion of MICU Orientation Checklist and MICU Critical Behavior Checklist.
4. Records must be available to the MCB, MDCIS or other appropriate regulatory agencies upon request.
5. Provide reports as deemed necessary by MCB, forward copies of all MICU transports to the MICU medical director for review.
6. All MICU personnel are expected to follow the procedures and protocols as stated in the policy if the MICU medical director, EMS medical director or MCB determines that the provider is in violation of the policy, the provider's or agency's MICU program approval may be suspended or revoked.

### III Equipment

1. See MICU Required Equipment list
2. MICU Narcotic Drug Box will be exchanged per MICU Narcotic Drug Box Exchange Procedure.

**MICU Program Policy**

**IV MICU Training Requirements**

1. Program faculty
  1. MICU Supervisor
    1. Responsible for supervision of all aspects of MICU program.
    2. Participates in selection, training and certification process for MICU paramedics
    3. Supervise and assure that education and proficiency requirements are met
    4. In conjunction with the MICU provider agency, provides data to MICU medical director and MCB as required.
  2. MICU Course Instructor - responsible for coordination and instruction of the MICU training program.
  3. Course Instructor(s) - provides initial and recertification training.
2. Student qualifications
  1. Fully licensed paramedic by MDCIS - EMS Division and employed by an approved ALS provider.
  2. Two years of experience as a paramedic and approval of the sponsoring agency.
3. MICU Initial Training Course
  1. Approved by MICU medical director
  2. See MICU Curriculum
4. MICU Paramedic approval
  1. Successful completion of MICU initial training course
  2. Successful completion of MICU paramedic test.
5. Senior MICU Paramedic approval
  1. Complete MICU Orientation Checklist and MICU Critical Behaviors Checklist.
  2. Complete MICU clinical experience.
  3. Approval of the MICU medical director and MICU supervisor.
- F Recertification - in order to maintain clearance as a Senior MICU paramedic, personnel must staff the MICU on a regular basis. If there has been a significant lapse in an individual's MICU experience they may be reclassified as an MICU paramedic until approved for Senior MICU status by the MICU supervisor and MICU medical director.

**V MICU Reporting**

2. Each MICU transport will be clearly documented on the MICU run sheet.
3. A copy of each run will be provided for the MICU supervisor and MICU medical director for review.
4. Monthly QI report listing number of MICU runs and sufficient identification information to assure complete individual run reporting.

**VI MICU Procedures**

1. See MICU Transport Capabilities for patients appropriate for the MICU. Patients not meeting these capabilities should be transported with additional staff or by alternative transport mechanisms (air medical).
2. Patient Treatment
  1. Transport treatment orders will be determined by the sending physician consistent with MICU transport capabilities.
  2. MICU personnel will use MICU Treatment Protocols for the standard treatment of MICU patients. Contact the MICU medical director, the sending or receiving physician or on-line medical direction for any problems.

**9-01a**

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**MOBILE INTENSIVE CARE UNIT TRANSPORT CAPABILITIES**

The Mobile Intensive Care Unit (MICU) has advanced capabilities to meet your transport needs. The MICU staff has been trained to transport critical but stable patients. Patient care and treatment are provided through State of Michigan approved protocols and 24-hour on call physician medical direction.

If the patient's stability and treatment fall within the following criteria as covered by the MICU's protocols, the MICU will be able to immediately accept your patient. If the patient is outside of these criteria, the MICU staff will contact our on-call physician and discuss whether the MICU is capable of transporting your patient. Usually the MICU is able to transport. However, if the MICU staff and physician decide the patient is outside our capabilities, we will work with you to explore other transport options, among which are having your hospital staff accompany the patient in the MICU, or utilizing helicopter transport.

<b><u>MEDICATIONS</u></b>
The following medications are covered by standard protocols, and are pre-approved for transport by the MICU:
<u>Vasoactive Medications</u> - Amiodarone, Dobutamine, Dopamine, Milrinone, Nitroprusside, Nitroglycerin, Norepinephrine.
<u>Beta Blockers</u> - Esmolol, Labetolol
<u>Thrombolytics</u> - Retavase, Streptokinase, TNKase, tPA.
<u>Paralytics</u> - The MICU is able to maintain paralysis with non-depolarizing neuromuscular blockers initiated at the sending facility, with drugs provided by the sending facility.
<u>Other Medications</u> - Other medications covered by protocol - Aggrastat, Amiodarone, Blood products, Cardizem, Heparin, Insulin, Integrellin, Lidocaine, Magnesium Sulfate, Mannitol, Morphine, Octreotide, Oxytocin, Phenytoin, Propofol, ReoPro, Somatostatin, Valium, Vasopressin and Versed. Other medications not listed above will be reviewed by the MICU on-call physician.
<b><u>VENTILATOR PATIENTS</u></b>
The MICU is equipped with a Univent 754 Eagle transport ventilator with multiple capabilities. Patients need to be stable on the ventilator with appropriate oxygenation. Patients with a PEEP greater than 7.5 will require review by the MICU on-call physician prior to transport.
<b><u>ADDITIONAL CAPABILITIES</u></b>
The MICU has additional capabilities to care for patients with special needs such as maintaining chest tubes, central lines, pacemakers and monitoring invasive line pressures.
<b><u>PATIENT CONDITION AND STABILITY</u></b>
The patient must be hemodynamically stable prior to transport, able to maintain a blood pressure greater than 90 mmHg.

Our goal is to provide the best and safest transport environment for our patients. While recognizing there is often an urgency in transferring a patient to another facility, we see it as essential for safe treatment that a patient be as stable as possible before leaving a facility in a mobile unit.

**9-02**

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**General Policy and Procedure**

**MICU Medical Director Role/Responsibilities**

The MICU medical director (MICU-MD) will be a physician appointed by the Washtenaw/Livingston County EMS medical director. The MICU-MD will be a board certified emergency physician actively practicing in Washtenaw or Livingston County. The MICU-MD will be responsible for oversight of the medical operations of the MICU and will provide:

1. 24 hour physician availability for MICU consultation. Both prospective triage evaluation and on-line medical direction are included in this function.
2. Review of all MICU runs providing feedback to the MICU personnel regarding appropriate triage and medical care during the MICU run.
3. Oversight of new MICU personnel training, curriculum, and credentialing of MICU personnel for MICU practice.
4. Oversight of MICU continuing education which will include didactic, practical, and run review formats.
5. Periodic MICU reports to the Medical Control Board.
6. Remediation of MICU personnel, if necessary.
7. Oversight of development of MICU treatment protocols.
8. Oversight of development of procedures for expanding MICU scope of practice.

The MICU-MD will be appointed for a one year term to be renewed at the discretion of the Medical Control Board and the MICU ambulance provider. This appointment will be a calendar year term with reappointment to coincide with Medical Control Board elections.

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**General Policy and Procedure**

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### **MICU Required Equipment List**

**Equipment & Drugs** - A cardiac monitor/defibrillator with external pacing is an ALS requirement in the W/L County MCA. The MICU also carries the following additional equipment:

- 1) pulse oximeter
  - 2) blood pressure/pulse monitor
  - 3) three IV infusion pumps
  - 4) portable ventilator
  - 5) two pressure infusion bags
  - 6) cellular telephone
  - 7) glucometer
  - 8) bag-valve with PEEP attachments
  - 9) drug box or jump kit, provided by the ambulance service, containing the following:
    - a) 3 - Epinephrine 1:10,000 - 10 ml syringe
    - b) 1 - Amiodarone 150 mg /3 ml syringe
    - c) 2 - Atropine Sulfate 1 mg/10 ml syringe
    - d) 1 - Nitroglycerin intravenous infusion 50 mg in 10 ml D5W (5 mg/ml)
    - e) 1 - Heparin intravenous infusion 10,000 u in 10 ml D5W (1000 units/ml)
- Any medication used from the MICU drug kit will be documented clearly on the MICU Run Form. Medications will be checked regularly for expiration and replaced as needed.
- 10) Two MICU Narcotic Drug Boxes, containing the following:
    - a) 2 - Morphine Sulphate 10 mg/mL, 1 mL ampules
    - b) 2 - Diazepam 5 mg/mL, 2 mL dosette vials
    - c) 2 - Versed 5 mg/mL, 1 mL dosette vials

Each MICU Narcotic Drug Box will be used on a single patient per physician orders and exchanged at the SJMH pharmacy per the MICU Narcotic Drug Box Exchange Procedures Policy.

All anticipated non-narcotic medications needed for the transport are provided by the sending facility. A standard ALS drug box is available if needed.

### **MICU Narcotic Drug Box Exchange Procedures**

1. The cooperating hospital's pharmacy shall accept the responsibility for permanent inventory reconciliation of a specific number of MICU narcotic drug boxes. It is the responsibility of the hospital pharmacy to develop and implement appropriate record keeping and security measures in accordance with Title 21, Federal Controlled Substances Act, which will minimize the potential for diversion.
2. The cooperating hospital pharmacy will stock the MICU drug boxes on accordance with the drug list approved by the MICU Medical Director and the Washtenaw/Livingston County Medical Control Authority.

#### **Procedure:**

- A. The drugs placed in the boxes shall be consistent throughout the stock of MICU narcotic drug boxes as to dosages, concentration prescribed by the MICU Required Equipment List.
- B. Labels shall be securely attached to the outside of all drug boxes which shall include:
  1. The name of the hospital pharmacy which last restocked the box.
  2. The date the box was last restocked.
  3. The legible initials of the pharmacist who inventoried and restocked the drug box.
  4. The earliest date at which any drug or solution in the box would expire (30 day lead time recommended).
- C. After the drug box has been inventoried, restocked, and appropriately labeled, the pharmacist will attach a blue plastic breakaway seal. A red seal will be placed in the box by the restocking pharmacy for use by the MICU Paramedic. The hospital pharmacy will be solely responsible for dispensing and accounting for these seals.
- D. The sealed drug boxes will be placed in a locked storage area in the SJMH outpatient pharmacy, or appropriate location designated by the SJMH pharmacy. Only staff designated by the SJMH pharmacy will have access to the drug boxes. A permanent record shall be maintained indicating the number on the drug box, the MICU Unit designation, the name of the MICU Paramedic to whom the drug box was issued, and the name of the pharmacy designated staff or pharmacist receiving or dispensing the box.
- E. The MICU run record shall serve as a permanent medical record of physician orders for drugs administered. It shall not be valid without a physician signature.
- F. When drugs from the box is used or whenever the pharmacy seal on the box is broken, the MICU Paramedic will place a copy of the MICU run record, signed by the physician, in the drug box. The MICU Paramedic will then reseal the drug box utilizing the red seal that the pharmacist placed in the drug box for that purpose.
- G. The used MICU narcotic drug box will then be exchanged for a pharmacy-sealed box at the SJMH pharmacy designated area under the supervision of the appropriate pharmacy staff. Once sealed by the pharmacist, the exchanged box will not be inventoried by the MICU Paramedic personnel prior to documented necessity for use.
- H. All requirements for signatures and filing of the MICU run report apply independent of the receiving facility whenever a MICU narcotic drug box used for patient transport.
- I. Any discrepancies in the drug box will be documented on ALS Medication Discrepancy Report and clearly labeled MICU Drug Box Discrepancy.
  1. If the discrepancy is discovered by the MICU Paramedic at the time of utilization the report form shall be co-signed by the other MICU crew members.
  2. Hospital pharmacists who note discrepancies in the drug box inventory, which cannot be accounted for by the MICU run records, shall initiate and sign the discrepancy form.

**MICU Narcotic Drug Box Exchange Procedure**

- 3. Copies of the discrepancy reports along with copies of the MICU run report are sent to the MICU Medical Director and the ambulance service who are responsible for evaluation and follow up and will retain the records for one year. The original is retained by the hospital pharmacy.
- 4. Controlled substances which are contaminated, lost through spillage, or partially used must be accounted for on the MICU run record by the MICU Paramedic and co-signed by other crew members.
- J. Locked and secure compartments or other locking devices approved by the Michigan Department of Consumer and Industry Services shall be provided on the MICU vehicle and utilized to prevent access to stored drugs by unauthorized persons.
- K. Any incident resulting in diversion of a controlled substance shall be promptly reported by the SJMH pharmacy. The report of the circumstances concerning the diversion shall be forwarded to the following:
  - 1. Board of Pharmacy.
  - 2. Michigan Department of Consumer and Industry Services.
  - 3. The local law enforcement agency.
  - 4. U.S. Department of Justice/Drug Enforcement Administration (Report from to DEA must be submitted on DEA Form 106 "Report of Theft or Loss of Controlled Substances").
  - 5. MICU Medical Director.
  - 6. EMS Medical Director.

**9-05a**

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MICU Treatment Protocol

**Generalized Protocol for MICU Transports**

Complete prior to transport:

1. Obtain a detailed history of patient's present illness prior to initial contact.
2. If available, obtain the most recent 12-lead ECG, ABG, labs and vital signs.
3. Obtain any orders from the sending facility along with any signed appropriate or expected orders (i.e., medications/drip rates; mechanical ventilator settings).
4. Proceed with initial patient contact and perform a physical examination which includes:
  1. LOC
  2. Breathing rate, rhythm, compliance and/or ventilator settings.
  3. Complete vital signs
  4. Cardiac monitoring
  5. Oxygen saturation
  6. IV site status; medication infusions labeled for accuracy; pump settings
5. Initiate MICU equipment interchanges and observe patient for adverse changes.
6. Ventilator patient will be monitored for continuous CO2 exchange.
  1. Maintain FI O2 per sending facility orders.
  2. Refer to specific ventilator protocol for additional information.

Complete during transport:

1. Patient assessment and vital signs will be performed at 15-30 minute intervals, dependent on patient status. Any abnormality will be addressed immediately per established ALS protocols or by direct contact with medical control.

Examples, but not limited to:

Equipment failure:

- S ventilators: address all warning tones per manufacturer recommendations. If unable to resolve, and patient shows signs of distress, ventilate patient via BVM with 100% O2.
  - S IV pumps: address alarms by checking IV site following up to the pump. Follow the manufacturer's recommendations.
2. Transfer patient care to the receiving facility. Give a verbal report along with the completed MICU MIR, any applicable paperwork and films from sending facility.

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## MICU Treatment Protocols

**Chest Pain**

**Indications:** MICU patients with active chest pain or anginal equivalent pain

**Administration of Nitroglycerin:** Mix nitroglycerin 25 mg in 250ml of normal saline. Begin infusion at 10-20 mcg/min and increase 5-10 mcg, q min, titrating for pain while maintaining systolic BP > 90. Maximum rate of 200 mcg/min.

<i>dose in (mcg/min)</i>	<i>ml/hr</i>	<i>dose in (mcg/min)</i>	<i>ml/hr</i>	<i>dose in (mcg/min)</i>	<i>ml/hr</i>
5 mcg	3 ml	70 mcg	42 ml	135 mcg	81 ml
10 mcg	6 ml	75 mcg	45 ml	140 mcg	84 ml
15 mcg	9 ml	80 mcg	48 ml	145 mcg	87 ml
20 mcg	12 ml	85 mcg	51 ml	150 mcg	90 ml
25 mcg	15 ml	90 mcg	54 ml	155 mcg	93 ml
30 mcg	18 ml	95 mcg	57 ml	160 mcg	96 ml
35 mcg	21 ml	100 mcg	60 ml	165 mcg	99 ml
40 mcg	24 ml	105 mcg	63 ml	170 mcg	102 ml
45 mcg	27 ml	110 mcg	66 ml	175 mcg	105 ml
50 mcg	30 ml	115 mcg	69 ml	180 mcg	108 ml
55 mcg	33 ml	120 mcg	72 ml	185 mcg	111 ml
60 mcg	36 ml	125 mcg	75 ml	190 mcg	115 ml
65 mcg	39 ml	130 mcg	78 ml	200 mcg	120 ml

**Contraindications:** Hypotension, hypersensitivity

**Adverse Effects:** Headache, flushing, hypotension, reflex tachycardia, bradycardia

**Administration of Morphine:** Initial dose 2-6mg IVP. Continue in 2mg increments, q 5 min as needed or until pain is relieved while maintaining systolic BP > 90.

**Contraindications:** Hypotension, hypersensitivity, suspected head or abdominal injury, non-vented patients with respiratory depression.

**Adverse effects:** Respiratory depression, hypotension or bradycardia. **Have naloxone available to reverse effects if necessary.** The hypotensive effects of nitroglycerine are worsened in patients on VIAGRA.

**MICU Directives:**

1. Follow generalized protocol for MICU patients.
2. Maintain vital signs within 5 minutes of administration every 15 minutes when stabilized or pain free.
3. Maintain delivery by IV infusion pump.
4. Continue to reassess patient for symptomatic improvement. Decrease or discontinue NTG if patient develops hypotension.
5. Suggest 325 mg mg of baby aspirin PO as indicated on all MI patients.

**9-07**

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MICU Treatment Protocol

**Chest Tubes**

\*MICU paramedics will monitor and troubleshoot chest tubes, they will NOT insert chest tubes.

Indications: Chest tubes are indicated for pneumothorax, hemothorax and pleural empyema.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Assure that the chest tube(s) is securely fastened to the patient.
3. Check chest tube(s) for patency and proper function prior to transport.
4. Assure that the long flexible tubing is securely fastened to the container that acts as a drainage device, water seal and suction control device. Assure that the tubing is free of kinks.
5. Make note of the fluid and blood levels in the drainage and water seal compartments.
6. Obtain orders as to the water seal level.
7. When suction is used, assure that there is bubbling in the suction control chamber. (If not, check the suction unit).
8. If the water seal fails to stop bubbling after the lung is reinflated or later begins to bubble:
  1. Momentarily clamp the flexible tubing near the chest. If the bubbles quit emanating from the tube while it is clamped, then the problem is either a persistent air leak in the patient's lung or the chest tube is not sealed at the chest wall.
  2. NEVER LEAVE THE CLAMP ON FOR MORE THAN A FEW SECONDS.
  3. Evaluate the insertion site.
  4. Apply occlusive dressings to the site.
  5. Evaluate the patient for distress.
  6. Consult physician immediately if needed.

If the bubbling does not cease during the clamping of the proximal end, then suspect a leak at a connection site in the tubing or the tubing itself.

1. Check all connections and secure with tape.
2. Seal the leak with occlusive dressing and tape or replace the tubing. When replacing the tubing, remember to clamp the distal end of the chest tube to avoid the formation of a pneumothorax.
9. If water seal device becomes damaged, a temporary water seal can be accomplished by putting flexible tubing into a bottle of sterile saline. Keep this device and tubing below chest level.
10. To clear clots from the tubing, squeeze the proximal end of the tubing with one hand and with the other below, squeeze the tube, stripping the material down the tube toward the drainage container.
11. Consult with the physician/staff for the best patient positioning.
12. If the chest tube is not functioning and a tension pneumothorax is suspected, perform a needle decompression of the affected side.

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MICU Treatment Protocol

**Hypotension (Non-Hypovolemic)**

Fluid treatment:

Reassure patient and control dysrhythmias. If systolic BP is < 90 mmHg and there is no sign of fluid overload administer a 250 cc NS fluid bolus and reassess. If systolic pressure remains < 90 mmHg and patient still shows no signs of fluid overload, give second fluid bolus of 250 cc of NS and assess again. May be repeated as indicated.

**9-09**

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## MICU Treatment Protocol

**Ventilators**

This protocol deals with considerations for the use of mechanical ventilators during interhospital transports. Typically, respiratory care settings will already have been established by physicians and administered by registered respiratory therapists.

1. Always keep a bag-valve mask (BVM) resuscitator close by in case of ventilator failure.
2. Patient lung sounds should be checked and tube placement verified via X-ray/CO2 detector.
3. Respiratory status should be established via ABG in newly intubated patients when available. Continuous CO2 detection and monitoring with the pulse oximeter will be used on all patients. If no pulse ox is attainable due to poor circulation, an ABG will be necessary to insure adequate ventilations.
4. Ventilator and circuit must be set up according to manufacturer's recommendations.
5. Patient should be placed on the ventilator approximately 5 minutes prior to departure (to make sure patient tolerates our ventilator well). Adjustments should be made prior to departure. Recommended vent settings: large patients = 12 cc/kg; small patients = 7 cc/kg. Assist Control (AC) and Synchronized Intermittent Mandatory Ventilations (SIMV) are acceptable modes of operation. Set Positive End Expiratory Pressure (PEEP) and Sigh as established by sending facility.
6. Patients not tolerating the ventilator should have airway adequacy rechecked. If okay, patient may be transported using BVM ventilation. If the problem is with the patient and not the ventilator, consider sedation/paralysis prior to departure. For sedation of ventilator patients, administer Versed (Midazolam) 1-2 mg every 5-10 minutes. Discontinue administration of sedative agent when desired sedation is achieved or when SBP is equal to or less than 90 mm Hg.
7. Once the patient is on the ventilator, expiratory volumes must be checked with the spirometer. The values should not exceed 100 cc of air difference, unless the patient has an uncuffed tube.
8. Patient's high and low pressure alarms can be set by taking the peak inspiratory pressure and adding 15 mmHg for the high value and subtracting 10 mmHg for the low value.
9. If the patient's respiratory status is unstable, contact medical control physician for approval to transport patient (i.e., hospital vent settings with PEEP greater than 8 mmHg).

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MICU Treatment Protocol

**Amiodarone (Cordarone)**

Indicators: Sustained severe ventricular tachycardia, supraventricular tachycardia, atrial fibrillations, ventricular fibrillation not controlled by first-line agents.

Contra-indications: Second or third degree AV block, bradycardia.

Adverse Effects: Flushing, edema, sinus arrest, hypotension, bradycardia, CHF, dysrhythmias, SA node dysfunction, nausea and vomiting, headache, dizziness, tremors, abdominal pain.

Administration: IV bolus 150 mg over 10 minutes (15 mg/min), then 360 mg over 6 hours (1 mg/min), then 540 mg over the remaining 18 hours (0.5 mg/min).

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain drip per sending facility orders.
3. Discontinue if significant adverse effects occur.

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## MICU Treatment Protocol

### Blood Administration

Blood administration may be continued by MICU paramedic. If additional units are indicated they may be initiated as ordered by the sending facility.

#### Indications:

Type and cross for donor units for the following conditions:

1. Obvious large amount of blood loss
2. Active or recent GI bleeding
3. TAA or AAA
4. Hgb < 8 mg/dl or Hct < 25%

Administration of blood (universal donor indicated) may be performed if delay for type and cross is determined to be potentially detrimental to the patient.

#### Adverse Effects:

Consider termination if:

1. Signs of anaphylaxis
2. CP, DIB, decreased BP and bleeding (may suggest hemolytic reaction).
3. Monitor fluid output and color (dark may suggest hemoglobinuria).

Contact sending facility physician, on-call MICU physician or medical control if:

1. Patient becomes febrile, i.e., one or two degrees Fahrenheit above baseline (document temperature at least twice during treatment, once at the sending facility and once before arrival at receiving facility).

#### Administration

Typically wide-open for management of shock or hemorrhage, otherwise as per medical direction.

#### MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Use large bore tubing (blood Y tube) and catheters in large veins.
3. Warm crystalloid prior to administrations.
4. Use isotonic solution only.
5. Pressure bag may be indicated.

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MICU Treatment Protocol

**Cardizem (Diltiazem)**

Indications: Control of rapid ventricular response with A-fib/A-flutter or PSVT.

Contra-indications: Allergy, hypotension, second and third degree heart block or V-tach.

Administration: Initial dose 20 mg (0.25 mg/kg) slow IV push over 2 minutes. Second dose at 25 mg (0.35 mg/kg) slow IV push 15 minutes after first dose if indicated. DRIP: Start continuous infusion at 5-15 mg/hr.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Increase drip in 5 mg increments (up to 15 mg/hr total) as necessary to control heart rate.
3. Discontinue if patient develops hypersensitivity (rash) or hemodynamic instability.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Dilantin (Phenytoin)**

Indications: Seizure disorders, head trauma

Contra-indications: Hypersensitivity, pregnancy, bradycardia

Adverse Effects: Nystagmus and ataxia are early signs of toxicity. May also see cardiac depressant effects including hypotension.

Administration: May be delivered in 0.9% NaCl (Sodium Chloride) ONLY. Adult loading dose is 15-20 mg/kg at a maximum infusion rate of 50 mg/min.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. May administer as piggy-back in main IV access if fluid is 0.9% NaCl. If not, a second IV must be started in order to delivery medication.
3. Continued seizure activity may require supplemental benzodiazepine.
4. Discontinue if patient develops hypersensitivity (rash) or hemodynamic instability.

MCA Approved	05/01			
Implement	05/01			

## MICU Treatment Protocols

**Dobutamine (Dobutrex)**

Indications: Patients with non-hypovolemic hypotension or low cardiac output along with pulmonary congestion.

Administration: Mix 250 mg Dobutamine in 250 cc of 0.9% NS or 5% Dextrose in water. Begin administering at 2 mcg/kg/min, titrate to systolic BC > 90 mmHg at lowest possible dose. Maximum dose 20 mcg/kg/min.

Patient Weight												
<u>mcg/kg</u> <u>/min</u>	<u>2.5</u> <u>kg</u>	<u>5</u> <u>kg</u>	<u>10</u> <u>kg</u>	<u>20</u> <u>kg</u>	<u>30</u> <u>kg</u>	<u>40</u> <u>kg</u>	<u>50</u> <u>kg</u>	<u>60</u> <u>kg</u>	<u>70</u> <u>kg</u>	<u>80k</u> <u>g</u>	<u>90</u> <u>kg</u>	<u>100</u> <u>kg</u>
<u>2 mcg</u>			<u>1</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>10</u>	<u>11</u>	<u>12</u>
<u>5 mcg</u>		<u>1.5</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>12</u>	<u>15</u>	<u>18</u>	<u>21</u>	<u>24</u>	<u>27</u>	<u>30</u>
<u>10 mcg</u>	<u>1.5</u>	<u>2</u>	<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>	<u>30</u>	<u>36</u>	<u>42</u>	<u>48</u>	<u>54</u>	<u>60</u>
<u>15 mcg</u>	<u>2</u>	<u>5</u>	<u>9</u>	<u>18</u>	<u>27</u>	<u>36</u>	<u>45</u>	<u>54</u>	<u>63</u>	<u>72</u>	<u>81</u>	<u>90</u>
<u>20 mcg</u>	<u>3</u>	<u>6</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>

*ml/hr*

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Monitor vital signs every 5-10 minutes.
3. Avoid increases in heart rate greater than 10%.
4. If tachyarrhythmias or ventricular ectopy occur, consider decreasing dose.
5. Caution in use in patients with MI, as may increase infarct.
6. If an invasive arterial line monitoring device is present and compatible with MICU equipment, continue monitoring during transport.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Dopamine (Inotropin)**

Indications: Non-hypovolemic hypotension unresolved by fluid challenge.

Administration: Mix 400 mg Dopamine in 250 cc of 0.9% NS or 5% Dextrose in water. Start administering at 5 mcg/kg/min. Increase in 5 mcg/kg/min increments. Titrate until patient's systolic BP is > 90 mmHg or maximum dose of 20 mcg/kg/min is reached (Dopamine is contra-indicated in hypovolemia).

**Patient Weight**

<u>mcg/kg/min</u>	<u>2.5 kg</u>	<u>5 kg</u>	<u>10 kg</u>	<u>20 kg</u>	<u>30 kg</u>	<u>40 kg</u>	<u>50 kg</u>	<u>60 kg</u>	<u>70 kg</u>	<u>80 kg</u>	<u>90 kg</u>	<u>100 kg</u>
<u>2 mcg</u>				<u>1.5</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
<u>5 mcg</u>		<u>1</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>9</u>	<u>11</u>	<u>13</u>	<u>15</u>	<u>17</u>	<u>19</u>
<u>10 mcg</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>8</u>	<u>11</u>	<u>15</u>	<u>19</u>	<u>23</u>	<u>26</u>	<u>30</u>	<u>34</u>	<u>38</u>
<u>15 mcg</u>	<u>1.4</u>	<u>3</u>	<u>6</u>	<u>11</u>	<u>17</u>	<u>23</u>	<u>28</u>	<u>34</u>	<u>39</u>	<u>45</u>	<u>51</u>	<u>56</u>
<u>20 mcg</u>	<u>2</u>	<u>4</u>	<u>8</u>	<u>15</u>	<u>23</u>	<u>30</u>	<u>38</u>	<u>45</u>	<u>53</u>	<u>60</u>	<u>68</u>	<u>75</u>

*ml/hr*

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. If possible, administer through large vein (i.e., antecubital), central line is preferred.
3. Monitor blood pressure every 5-10 minutes.
4. Frequently assess for undesirable effects of increased preload and afterload.
5. Caution in use in patients with MI, as may increase infarct.
6. If an invasive arterial line monitoring device is present and compatible with MICU equipment, continue monitoring during transport.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Esmolol (Brevibloc)**

Indications: Rapid control of SVT, atrial fibrillation or flutter.

Contra-indications: Should not be given to patients with COPD or cardiac conduction abnormalities (second or third degree heart block) or in the presence of hypotension, shock or bronchospasm.

Adverse Effects: Hypotension, bradycardia, bronchospasm

Administration: Mixing instructions: 5 grams in 500ml, 5% dextrose or 0.9% normal saline.  
 Loading dose of 500 mcg/kg over 1 minute followed by infusion of 50 mcg/kg/min. If no therapeutic effect after 5 minutes, may repeat loading dose and increase infusion to 100 mcg/kg/min. This sequence may be repeated every 5 minutes to a maximum infusion of 200 mcg/kg/min.

**Patient Weight**

<b><u>mg/kg/m</u></b> <b><u>in</u></b>	<b><u>40</u></b> <b><u>kg</u></b>	<b><u>50</u></b> <b><u>kg</u></b>	<b><u>60</u></b> <b><u>kg</u></b>	<b><u>70</u></b> <b><u>kg</u></b>	<b><u>80</u></b> <b><u>kg</u></b>	<b><u>90</u></b> <b><u>kg</u></b>	<b><u>100</u></b> <b><u>kg</u></b>	<b><u>110</u></b> <b><u>kg</u></b>	<b><u>120</u></b> <b><u>kg</u></b>
<b><u>50 mcg</u></b>	<u>12</u>	<u>15</u>	<u>18</u>	<u>21</u>	<u>24</u>	<u>27</u>	<u>30</u>	<u>33</u>	<u>36</u>
<b><u>100 mcg</u></b>	<u>24</u>	<u>30</u>	<u>36</u>	<u>42</u>	<u>48</u>	<u>54</u>	<u>60</u>	<u>66</u>	<u>72</u>
<b><u>150 mcg</u></b>	<u>36</u>	<u>45</u>	<u>54</u>	<u>63</u>	<u>72</u>	<u>81</u>	<u>90</u>	<u>99</u>	<u>108</u>
<b><u>200 mcg</u></b>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>	<u>132</u>	<u>144</u>

***ml/kg***

MICU Directives:

1. Follow protocol for generalized MICU transports.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor vital signs every 5 minutes.
4. Discontinue if patient develops hypotension, bradycardia, bronchospasm.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Glycoprotein IIb/IIIa Receptor Antagonist for Acute Coronary Syndromes**

**Indications:** In combination with Heparin for the treatment of acute coronary syndromes, including unstable angina and non Q-wave AMI and for those patients who are to be managed medically and those undergoing PTCA or artherectomy.

**Contra-indications:**

1. Known hypersensitivity.
2. Active internal bleeding or a history of significant bleeding within the previous 30 days.
3. History of intracranial hemorrhage, intracranial neoplasm, arteriovenous malformation or aneurysm.
4. History of thrombocytopenia following prior exposure to Aggrastat, Integrelin or ReoPro.
5. History of CVA within 30 days or any history of hemorrhagic stroke.
6. Major surgical procedure or severe physical trauma within previous month.
7. History, symptoms or findings suggestive of aortic dissection.
8. Severe HTN (systolic BP > 180 mmHg and/or diastolic BP > 110 mmHg).
9. Concomitant use of another parenteral IIb/IIIa inhibitor.

**Adverse Effects:** Bleeding, edema/swelling, hypotension, bradycardia, pain, dizziness, sweating, nausea.

**Administration:** All may be used with ASA and Heparin

- Integriline (Eptifibatide): IV bolus 180 mcg/kg, then continuous IV infusion of 2 mcg/kg/min, up to 72 hours.
- Aggrastat (Tirofiban): IV 0.4 mcg/kg/min for 30 minutes then 0.1 mcg/kg/min; give **2** dose in renal disease.
- ReoPro (Abciximab): IV 250 mcg (0.25 mg) /kg bolus, then continuous IV infusion of 10 mcg/min for up to 12 hours.

**MICU Directives:**

1. Follow generalized protocol for MICU transport.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor V/S every 5-10 min.
4. Discontinue after notifying appropriate medical facility if patient develops severe hypotension, active bleeding or hypersensitivity.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Heparin**

**Indications:** Acute myocardial infarction, pulmonary embolism, deep vein thrombosis (DVT), disseminated intravascular coagulation (DIC).

**Contra-indications:** Active bleeding, known or suspected intracranial hemorrhage, chronic renal failure, recent surgery or other significant risk for bleeding such as thrombocytopenia or hemophilia. Patients who have already received Lovenox. (1.5 mg/kg wait 24 hours. 1 mg/kg or less wait 12 hours).

**Administration:** Recommended mixing instructions are 25,000 units mixed into 250 cc of NS. For suspected cardiac patients: Initial bolus is 60 units/kg IVP followed by an infusion of 12 units/kg/hr. For all other patients: Initial bolus is 70 units/kg IVP followed by an infusion of 16 units/kg/hr.

**MICU Directives:**

1. Following generalized protocol for MICU transports.
2. Consider stopping infusion if patient develops signs of bleeding such as petechiae or bruising, hematemesis, bleeding from the gums, epistaxis, sudden tachycardia or hypotension.
3. Concurrent use of oral anticoagulant, thrombolytic and salicylates or IIb/IIIa antagonist can increase risks of bleeding.
  - A. Suggest a heparin drip on all post-thrombolytic patients.
  - B. Suggest 325 mg of baby aspirin PO as indicated on all MI patients.
  - C. Suggest running all heparin drips at 12 U/kg/hr when indicated.
  - D. Suggest a heparin drip on all cardiac patients when indicated.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Insulin**

Indications                      Hyperglycemia, ketoacidosis

Contra-indications:        Hypersensitivity to particular insulin formulation.

Adverse Effects:            Hypoglycemia

Administration:        As per physician orders; typically initial bolus of 6-10 units IV push followed by infusion of 2-10 u/hr.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Check glucose every 30 minutes; may give additional bolus and or titrate as per medical direction.
3. Check glucose if developing signs of hypoglycemia; if glucose < 80, administer D50 (Dextrose) 50 ml IV push and recheck glucose in 5 minutes.
4. Discontinue if unable to maintain glucose > 80 or if patient develops signs of hypersensitivity.
5. Initiate a second IV line when using an insulin drip due to its incompatibility with many drugs.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Labetolol (Normodyne, Trandate)**

Indications: Hypertension

Contra-indications: Bronchial asthma, overt cardiac failure, greater than first-degree heart block, cardiogenic shock, severe bradycardia, hypotension, hypersensitivity.

Adverse Effects: Bradycardia, hypotension, dizziness, ventricular arrhythmias, bronchospasm.

Administration: Initial infusion, 20 mg IV over 2 minutes. Repeat injections of 40 to 80 mg every 10 minutes until maximum dosage of 300 mg is reached.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor vital signs every 5-10 minutes.
4. Discontinue and notify appropriate medical direction facility if patient develops severe hypotension, bradycardia, bronchospasm or hypersensitivity occurs.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Magnesium Sulfate**

Indications: Seizure prevention or control in severe pre-eclampsia or eclampsia.

Contra-indications: Do not give in toxemia of pregnancy during the 2 hours preceding delivery.

Adverse Effects: Flushing, sweating, hypotension, depressed reflexes, respiratory paralysis, increased PR interval, heart block.

Administration: Initial dose 2-4 gms IV, infusion 1-4 gms/hr.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain drip per sending facility orders.
3. Discontinue if significant adverse effects occur.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Mannitol (Osmitrol)**

**Indications:** Adjunct in the treatment of acute oliguric renal failure. Adjunct in the treatment of cerebral edema.  
Reduction in intracranial or intraocular pressure.

**Contra-indications:** Hypersensitivity, anuria, dehydration, active intracranial bleeding.

**Administration:** **Cerebral edema, oliguric renal failure:** 50-100 g IV as a 5-25% solution. May precede with a test dose of 0.2 g/kg over 3-5 minutes.  
**Reduction of intracranial or intraocular pressure:** IV, 0.25-2 g/kg as a 15-25% solution over 30-60 minutes.

**MICU Directives:**

1. Follow generalized protocol for MICU transports.
2. Administer as ordered unless significant adverse effects occur.

MCA Approved	05/01			
Implement	05/01			

## MICU Treatment Protocols

**Milrinone (Corotrope, Primacor)**

Indications: Short-term management of congestive heart failure.

Contra-indications: Hypersensitivity.

Adverse Effects: Headache, ventricular arrhythmias

Administration: Initial IV loading dose of 50 mcg/kg over 10 minutes followed by an infusion of 0.375 - 0.75 mcg/kg/min. (mix 20mg Milrinone in 80 ml/D5W). Maximum dose 1.13 mg/kg/day.

**Patient Weight**

<i>mcg/kg/min</i>	50 kg	60 kg	70 kg	80 kg	90 kg	100 kg
<b><u>0.375 mcg</u></b>	<u>5.6</u>	<u>6.8</u>	<u>7.9</u>	<u>9</u>	<u>10.1</u>	<u>11.3</u>
<b><u>0.5 mcg</u></b>	<u>7.5</u>	<u>9</u>	<u>10.5</u>	<u>12</u>	<u>13.5</u>	<u>15</u>
<b><u>0.625 mcg</u></b>	<u>9.4</u>	<u>11.3</u>	<u>13.1</u>	<u>15</u>	<u>16.9</u>	<u>18.8</u>
<b><u>0.75 mcg</u></b>	<u>11.3</u>	<u>13.5</u>	<u>15.8</u>	<u>18</u>	<u>20.3</u>	<u>22.5</u>

***ml/hr***MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor vital signs every 5-10 minutes.
4. Discontinue and notify appropriate medical direction facility if patient develops severe hypotension or hypersensitivity occurs.
5. If an invasive arterial line monitoring device is present and compatible with MICU equipment, continue monitoring during transport.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Morphine Sulfate**

Indications: Severe pain, chest pain, pulmonary edema, analgesic in patients receiving paralytics.

Contra-indications: Hypersensitivity history, suspected head or abdominal injury, non-vented patients with respiratory depression, hypotension.

Adverse Effects: Respiratory depression, hypotension or bradycardia. **Have naloxone available to reverse effects if necessary.**

Administration: Initial dose of 2-5 mg IVP. Continue in 2 mg increments PRN until pain is relieved or until signs of respiratory depression occur. DRIP: 250 mg/250 ml or 500 mg/250 ml concentration, titrate to effect.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Reassess vital signs within 5 minutes of administration.
3. Have naloxone (Narcan) available to reverse effects if necessary.

MCA Approved	05/01			
Implement	05/15			

## MICU Treatment Protocols

**Nitroglycerin (Nitro-Bid IV, Nitrostat IV, Tridil)**

Indications: Angina, acute MI, CHF with pulmonary edema

Contra-indications: Hypotension, hypersensitivity, recent Viagra use

Adverse Effects: Headache, flushing, hypotension, reflex tachycardia, bradycardia

Administration: **ORAL:** 0.4 mg tab sublingual, may repeat every 5 minutes to a maximum of 3 doses. **DRIP:** **Mix 25 mg Nitroglycerin in 250 ml of NS.** Start infusion at 10-20 mcg/min and increase by 5-10 mcg/min every 5 minutes, titrating for pain and symptomatic relief while maintaining systolic BP > 90. Maximum rate of 200 mcg/min.

<u>dose in (mcg/min)</u>	<u>ml/hr</u>	<u>dose in (mcg/min)</u>	<u>ml/hr</u>	<u>dose in (mcg/min)</u>	<u>ml/hr</u>
5 mcg	3 ml	70 mcg	42 ml	135 mcg	81 ml
10 mcg	6 ml	75 mcg	45 ml	140 mcg	84 ml
15 mcg	9 ml	80 mcg	48 ml	145 mcg	87 ml
20 mcg	12 ml	85 mcg	51 ml	150 mcg	90 ml
25 mcg	15 ml	90 mcg	54 ml	155 mcg	93 ml
30 mcg	18 ml	95 mcg	57 ml	160 mcg	96 ml
35 mcg	21 ml	100 mcg	60 ml	165 mcg	99 ml
40 mcg	24 ml	105 mcg	63 ml	170 mcg	102 ml
45 mcg	27 ml	110 mcg	66 ml	175 mcg	105 ml
50 mcg	30 ml	115 mcg	69 ml	180 mcg	108 ml
55 mcg	33 ml	120 mcg	72 ml	185 mcg	111 ml
60 mcg	36 ml	125 mcg	75 ml	190 mcg	114 ml
65 mcg	39 ml	130 mcg	78 ml	195 mcg	120 ml

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Monitor vital signs every 5 minutes during titration, every 15 minutes when held at a stable dose.
3. Maintain appropriate delivery by IV infusion pump.
4. Continue to reassess patient for symptomatic improvement. Decrease or discontinue infusion if patient develops severe adverse effects.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

## MICU Treatment Protocols

**Nitroprusside (Nitropress)**

**Indications:** Hypertensive emergencies including stroke, aortic dissection, acute MI, CHF.

**Contra-indications:** Compensatory hypertension. Extreme caution indicated in use with patients with renal or hepatic insufficiency.

**Adverse Effects:** Hypotension, tachycardia, thiocyanate and cyanide toxicity found especially in patients with renal or hepatic insufficiency: Thiocyanate toxicity may be seen by tinnitus, blurred vision and delirium.

**Administration:** Infusion of 0.5 to 10 mcg/kg/min. (mix 50 mg Nitroprusside in 250 ml/D5W) titrated carefully to desired effect.

<b>Patient Weight</b>								
<b>mcg/min</b>	<b>30 kg</b>	<b>40 kg</b>	<b>50 kg</b>	<b>60 kg</b>	<b>70 kg</b>	<b>80 kg</b>	<b>90 kg</b>	<b>100kg</b>
<b>0.5 mcg</b>	4.5	6	7.5	9	10	12	14	15
<b>1 mcg</b>	9	12	15	18	21	24	27	30
<b>2 mcg</b>	18	24	30	36	42	48	54	60
<b>4 mcg</b>	26	48	60	72	84	96	108	120
<b>8 mcg</b>	72	96	120	144	166	192	216	240
<b>10 mcg</b>	90	120	150	180	210	240	270	300

**ml/hr**

**MICU Directives:**

1. Follow generalized protocol for MICU transports.
2. Maintain appropriate delivery by IV infusion pump.
3. Monitor vital signs every 5 minutes.
4. Solution bag should be wrapped in foil due to light sensitivity.
5. If an invasive arterial line monitoring device is present and compatible with MICU equipment, continue monitoring during transport.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Norepinephrine (Levophed)**

Indications: Acute hypotension, shock

Contra-indications: Hypersensitivity, ventricular fibrillation, tachy-dysrhythmias.

Adverse Effects: Dizziness, palpitations, tachycardia, HTN, PVC-s, angina, nausea, vomiting, necrosis, tissue sloughing with extravasation, dyspnea, decreased urine output.

Administration: 2-12 mcg/min IV infusion. Titrate until patient-s systolic BP is > 90 mmHg. (Norepinephrine is contra-indicated in hypovolemia).

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. If possible, administer through large vein (i.e., antecubital), central line is preferred. A second peripheral line of NS or LR is also preferred.
3. Monitor blood pressure every 5-10 minutes.
4. Frequently assess for undesirable effects of increased preload and afterload.
5. Caution in use with patients with MI, as may increase infarct.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Oxytocin (Pitocin) and Related Medications**

These drugs act to cause smooth muscle contraction and are used as drips to control bleeding. Vasopressin, Octreotide Acetate, and Somatostatin are related medications.

Indications: Control of postpartum hemorrhage or bleeding from esophageal varices.

Adverse Effects: Hypertension. May see tachycardia, hypotension in patient with heart disease.

Administration: As per medical direction, usually 10-40 U/min for Pitocin.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Monitor vital signs every 10 minutes.
3. Be aware of shock in the presence of ongoing hemorrhage.
4. Titrate as indicated for worsening hemorrhage or development of adverse effects such as severe hypertension.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Paralytics: Non-Depolarizing Neuromuscular Blockers (NDMB)**

Patients who are on non-depolarizing neuromuscular blockers (NDMB-s) initiated at the sending facility may be transported by MICU paramedics. Recurrent bolus or drip administration as ordered by the sending facility may be continued during transport.

Indications: Muscular paralysis, either for pre-intubation induction or continued paralysis of intubated patients.

Adverse Effects: Duration of action of pancuronium and vecuronium will be extended in patients with hepatic or renal disease. NDMB effects will also be potentiated with hypothermia, dehydration, respiratory acidosis, hypokalemia. Effects of NDMB-s will be decreased in the presence of respiratory alkalosis and decreased peripheral perfusion.

Administration:

	<u>Adult</u>	<u>Pediatric</u>
Vecuronium:	0.1-0.15 mg/kg IV	same
Pancuronium:	0.1 mg/kg IV	same
Atracurium:	0.5 mg/kg IV (age > 2)	0.3-0.4 mg/kg IV (age < 2)
Rocuronium:	0.6-1.2 mg/kg IV	N/A

MICU Directives:

1. NDMB-s will be used only on intubated patients.
2. Assess frequently for correct tube position and adequate ventilation. Continuous pulse oximetry and CO2 detection is mandatory.
3. Monitor vital signs every 10 minutes.
4. Assess need for additional sedation or redosage of NDMB frequently.
5. Redose as indicated.

RSI cleared MICU paramedics may use the RSI procedure as outlined in Protocol II-1 (Emergency Airway Techniques) for medical and trauma patients, as needed).

MCA Approved	05/01			
Implement	05/01			

## MICU Treatment Protocols

**Propofol (Diprivan)**

Indications: IV sedative-hypnotic agent

Contra-indications: Hypersensitivity (including egg lecithin, soybean oil and glycerol).

Adverse Effects: Bradycardia, hypotension, hypertension, decreased cardiac output.

Administration: For sedation: Initial infusion, (mix 1gm Propofol in 100 ml NS), 5 mcg/kg/min for 5 minutes. Increase rate at 5- 10 minute intervals in increments of 5 to 10 mcg/kg/min until desired level of sedation is achieved. Rates of 5 to 50 mcg/kg/min or higher may be required.

**Patient Weight**

<i>mcg/kg/ min</i>	<b>35 kg</b>	<b>40 kg</b>	<b>45 kg</b>	<b>50 kg</b>	<b>55 kg</b>	<b>60 kg</b>	<b>65 kg</b>	<b>70 kg</b>	<b>75 kg</b>	<b>80 kg</b>	<b>90 kg</b>	<b>100 kg</b>
<b>5 mcg</b>	1.05	1.2	1.35	1.5	1.65	1.8	1.95	2.1	2.25	2.4	2.7	3
<b>10 mcg</b>	2.1	2.4	2.7	3	3.3	3.6	3.9	4.2	4.5	4.8	5.4	6
<b>20 mcg</b>	4.2	4.8	5.4	6	6.6	7.2	7.8	8.4	9	9.6	10.8	12
<b>30 mcg</b>	6.3	7.2	8.1	9	9.9	10.8	11.7	12.6	13.5	14.4	16.2	18
<b>40 mcg</b>	8.4	9.6	10.8	12	13.2	14.4	15.6	16.8	18	19.2	21.6	24
<b>50 mcg</b>	10.5	12	13.5	15	16.5	18	19.5	21	22.5	24	27	30
<b>60 mcg</b>	12.6	14.4	16.2	18	19.8	21.6	23.4	25.2	27	28.8	32.4	36
<b>70 mcg</b>	14.7	16.8	18.9	21	23.1	25.2	27.3	29.4	31.5	33.6	37.8	42
<b>80 mcg</b>	16.8	19.2	21.6	24	26.4	28.8	31.2	33.6	36	38.4	43.2	48
<b>90 mcg</b>	18.9	21.6	24.3	27	29.7	32.4	35.1	37.8	40.5	43.2	48.6	54
<b>100 mcg</b>	21	24	27	30	33	36	39	42	45	48	54	60

*ml/hr*

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor vital signs every 5- 10 minutes.
4. Discontinue and notify appropriate medical direction facility if patient develops severe hypotension, bradycardia or hypersensitivity occurs.

MCA Approved	05/01	07/02		
Implement	05/01	01/03		

MICU Treatment Protocols

**Thrombolytics**

Indications: Evolving acute MI, ideally within 6 hours of onset, with diagnostic ECG changes.

Contra-indications:

1. Allergy to agents.
2. Any predisposition to or active bleeding, including recent surgery or stroke, trauma.
3. Severe hypertension
4. Pregnancy
5. Prior use of Streptokinase within previous 6 months is a contra-indication to repeat administration of Streptokinase, but not tPA.

Precautions:

Complications may develop in patients with internal (occult) hemorrhage, multiple needle puncture sites, severe hepatic or renal insufficiency. Be aware of the potential for reperfusion dysrhythmias.

Administration:

1. Streptokinase: 1.5 million units in 50 ml 0.9% NaCl IV over 30-60 minutes as BP tolerates.
2. tPA: A total dose not to exceed 100 mg. Initial 15 mg is given as bolus, then 0.75 mg/kg (not to exceed 50 mg) is given over 30 minutes followed by 0.50 mg/kg (not to exceed 35 mg) is given over 30 minutes.
3. Retavase: Double bolus injection of 10 units over 2 minutes followed by a second 10 unit bolus over 2 minutes, 30 minutes after the start of the first bolus.
4. TNKase (Tenecteplase): Single bolus injection over 5 seconds. If patient is **<60kg administer 30 mg**, >60kg to <70kg administer 35 mg, **>70kg to < 80kg administer 40 mg**, > 80kg to <90kg administer 45 mg, **>90kg administer 50 mg**.
5. These are recent dosing recommendations. As these may change or the dosing used may differ at various sending facilities, when continuing thrombolytic drips for transport, use dosing regimens prescribed by the sending facility.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Maintain at least 2 open IV lines during administration.
3. Monitor vital signs every 5-10 minutes during infusions and every 10 minutes when infusion is complete.
4. Administer repeat bolus of Retavase if ordered at 30 minutes following first bolus.
5. Avoid unnecessary punctures and minimize patient handling.
6. Heparin 60 U/kg bolus followed by 12 U/kg/hr infusion should be give ASAP in conjunction with thrombolytic administration.
7. Discontinue thrombolytic if patient develops hypotension or active bleeding (i.e., bleeding gums, spontaneous petechiae or bruising, hematemesis, epistaxis).

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Valium (Diazepam)**

Indications: Seizures, status epilepticus, muscle spasms, acute ETOH withdrawal, anxiety, precardioversion.

Contra-indications: Know allergy, hypotension

Adverse Effects: Respiratory depression, apnea, hypotension

Administration: **Seizures:** 5-10 mg slow IVP up to 30 mg at 5 minute intervals. **Anxiety:** 2-5 mg slow IVP, 5-10 mg slow IVP for severe anxiety. **Precardioversion:** 2-5 mg IVP.

MICU Directives:

1. Follow generalized protocol for MICU transports.
2. Hold dose if BP <90 mmHg systolic.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Versed (Midazolam)**

**Indications:** Sedation for patients on a ventilator, precardioversion sedation, adjunct with paralytics for rapid sequence intubation (RSI).

**Contra-indications:** Known allergy, hypotension

**Adverse Effects:** Respiratory depression, apnea, hypoxia, nausea and vomiting, allergic reaction.

**Administration:**     **Sedation:** 1-2 mg initial dose slow IVP over 30 seconds to a minute. 0.5-2 mg incremental doses as indicated. Sedation endpoint per sending orders or when BP is  $\leq$  90 mmHg systolic.  
                                  **Precardioversion:** 2-4 mg slow IVP.

**Onset/Action:**

1. Versed has a rapid onset of 45-90 seconds and it has a short duration of 15-60 minutes with a half life of approximately 2 hours.
2. Versed is 3-4 times as potent as Valium.

**MICU Directives:**

1. Follow generalized protocols for MICU transports.
2. Hold dose if BP < 90 mmHg systolic.

MCA Approved	05/01			
Implement	05/01			

MICU Treatment Protocols

**Nesiritide (Natrecor)**

**Indications:** Acutely decompensated congestive heart failure patients who have dyspnea at rest or with minimal activity.

**Contra-indications:** Hypersensitivity to any of its components and it should be avoided in patients suspected of having, or known to have, low cardiac filling pressure. **Nesiritide should not be used as primary therapy for patients with known cardiogenic shock or patients with SBP less than 90mmHg.**

**Adverse Effects:** Prolonged hypotension (mean duration of greater than 2 hours in length).

**Administration:** Initial bolus of 2 mcg/kg (over 60 seconds) followed by an infusion of 0.01mcg/kg/min. ***Nesiritide should not be titrated. If hypotension is observed discontinue infusion.*** (mix 1.5mg of reconstituted Nesiritide in 250ml D5W or 0.9%NS. this will give you a concentration of 6 mcg/ml).

Patient Weight						
	60kg	70kg	80kg	90kg	100kg	110kg
<i>Bolus (ml/60sec)</i>	20	23.3	26.7	30	33.3	36.7
	60kg	70kg	80kg	90kg	100kg	110kg
<i>inf. rate (ml/hr)</i>	6	7	8	9	10	11

**MICU Directives:**

1. Follow generalized protocol for MICU transports.
2. Maintain appropriate delivery rate by IV infusion pump.
3. Monitor vital signs every 5-10 minutes.
4. Discontinue and notify appropriate medical direction facility if patient develops severe hypotension or hypersensitivity occurs.
5. If an invasive arterial line monitoring device is present and compatible with MICU equipment, continue monitoring during transport.

MCA Approved	04/04			
Implement	11/04			

## MICU Treatment Protocols

**Procainamide Hydrochloride (Pronestyl)**

**Indications:** VT, SVT, V-Fib, Ventricular Arrhythmia

**Contra-indications:** Hypotension, known hypersensitivity to procainamide or any other local anesthetic of the amide type, second or third degree AV block unless an electrical pacemaker is operative, torsades de pointes, myasthenia gravis, systemic lupus erythematosus.

**Adverse Effects:** Hypotension, QT prolongation, QRS widening, confusion, tachycardia, torsades de pointes, and systemic lupus erythematosus.

**Administration:** **LOAD:** 17mg/kg (or 1g) administered no faster than 20-30 mg/min. Discontinue if QRS interval increases by 50%, hypotension occurs, arrhythmia ceases or total of 1g is given. **MAINTENANCE: Mix 1g Procainamide in 250 ml of NS or D5W.** 1-6 mg/min or 1-2.7 mg/kg/hr.

<b>dose (mg/min)</b>	<b>rate ml/hr</b>	<b>Dose (mg/min)</b>	<b>rate ml/hr</b>	<b>dose (mg/min)</b>	<b>Rate ml/hr</b>
1 mg/min	16 ml/hr	3 mg/min	46 ml/hr	5 mg/min	76 ml/hr
1.5 mg/min	22 ml/hr	3.5 mg/min	52 ml/hr	5.5 mg/min	82 ml/hr
2 mg/min	30 ml/hr	4 mg/min	81 ml	6 mg/min	90 ml/hr
2.5 mg/min	38 ml/hr	4.5 mg/min	84 ml		

**MICU Directives:**

1. Follow generalized protocol for MICU transports.
2. Monitor vital signs every 5 minutes during titration, every 15 minutes when held at a stable dose.
3. Maintain appropriate delivery by IV infusion pump.
4. Continue to reassess patient for symptomatic improvement. Decrease or discontinue infusion if patient develops severe adverse effects.

MCA Approved	04/04			
Implement	11/04			