V 1.1

Critical Care Protocols

MCLEAN COUNTY AREA EMS SYSTEM

DR. JOEL NILLES, DO, DR. JULIE LEWIS, MD, AND TRAVIS WILSON, NRP

Contents

Overview

Purpose:

The McLean County Area EMS System recognizes the need to transport critically ill and injured patients from outlying hospitals to larger tertiary care centers. Some patients will require additional skills and procedures that paramedics do not normally perform for stabilization during or prior to transport. Some patients will require administration or maintenance of medications not normally carried by Advanced Life Support vehicles. This will outline the requirements for initial training, continuing education, approved additional skills, procedures, medications, quality assurance and improvement.

Use of these Protocols:

These protocols are only for use by critical care approved agencies. In addition, these protocols are only to be utilized in the inter-facility transfer environment. Under no circumstance shall a critical care protocol be utilized on a 911 response. In the event that a patient presentation is outside the scope of these protocols critical care providers shall choose the most appropriate critical care or standing ALS orders to begin care while contacting medical control or the receiving attending physician for further consultation and direction.

Right to Deny Transport

A System approved Critical Care Transport Agency has the right to deny transport under the following conditions:

1. If providing Critical Care transport will impede the ability for the Agency to provide emergency ALS response within their response area due to staffing or equipment challenges
2. If it is deemed the patient is not stable enough for ground transport after consultation with Medical Control
3. If the safety of the patient and crew is at significant risk, i.e. weather, road conditions, violent patients

Medical Control Orders and Guidance

During an interfacility transfer, when a situation arises where medical control guidance is needed, providers should attempt to contact the receiving physician or sending physician for clarification on medication administration and treatment. If unable to contact them or an emergent need arises you may contact the Resource Hospital (or Associate Hospital) for guidance on medication or treatment. EMS personnel can only receive orders within their scope of practice and what is already within the Critical Care or 911 protocols. No provider can receive orders from a sending or receiving physician that falls outside of scope of practice or protocols. When reading this protocol the phrase CONTACT MEDICAL CONTROL means you may contact the receiving, sending or Resource hospital (or Associate Hospital) physician.

IDPH Definitions

As defined by the EMS Administrative Code Section 515.860

1. "Critical care transport" means the pre-hospital or inter-hospital transportation of a critically injured or ill patient by a vehicle service provider, including the provision of medically necessary supplies and services, at a level of service beyond the scope of the EMT-Paramedic. When medically indicated for a patient, as determined by a physician licensed to practice medicine in all of its branches, an advanced practice nurse, or a physician's assistant, in compliance with Section 3.155(b) and (c) of the EMS Act, critical care transport may be provided by:
    a. Illinois Department of Public Health approved critical care transport providers, not owned or operated by a hospital, utilizing EMT-Paramedics with additional training, nurses, or other qualified health professionals; or
    b. Hospitals, when utilizing any vehicle service provider or any hospital-owned or operated vehicle service provider. Nothing in the Act requires a hospital to use, or to be, an Illinois Department of Public Health approved critical care transport provider when transporting patients, including those critically injured or ill. Nothing in the EMS Act shall restrict or prohibit a hospital from providing, or arranging for, the medically appropriate transport of any patient, as determined by a physician licensed to practice medicine in all of its branches, an advanced practice nurse, or a physician's assistant. (Section 3.10(f-5) of the EMS Act)
2. "Expanded scope of practice" includes the accepted national curriculum plus additional training, education, experience, and equipment as approved by the Illinois Department of Public Health pursuant to Section 3.55 of the EMS Act. Tier I transport are considered "expanded scope of practice."

Capabilities by Tier

Medications

Medication Name	Tier I	Tier II	Tier III
Acetaminophen	X	X	X
Amidate	X (IV Push Only)	X	X
Amiodarone	X	X	X
Blood Administration		X	X
Cardizem	X	X	X
Clopidogrel		X	X
Dilaudid	X	X	X
Dexamethasone		X	X
Dexmedetomidine		X	X
Dopamine		X	X
Famotidine		X	X
Fentanyl	X	X	X
Fosphenytoin		X	X
H2 Blockers	X	X	X
Heparin	X Static	X	X
Hyperalimentation		X	X
Hypertonic Saline		X	X
Ibuprofen	X	X	X

Insulin		X	X
Integrilin		X	X
IV Antibiotics	X Static	X	X
IV KCL	X	X	X
Lasix Infusion	X	X	X
Levophed	X (Dynamic or Static)	X	X
Levetiracetam		X	X
Magnesium Sulfate	X (Drips or IV Push)	X	X
Mannitol		X	X
Midazolam	X (IV Push or Drip)	X	X
Morphine Infusion	X Static	X	X
MVI	X	X	X
Natrecor		X	X
Nicardipine		X	X
Nitroglycerin Infusion	X (Dynamic or Static)	X	X
Norcuron		X	X
Phenobarbital		X	X
Prasugrel		X	X
Primacor		X	X
Promethazine		X(Static)	X(Dynamic)
Propofol		X	X
Ranitidine		X	X
Reopro		X	X
Succinylcholine		X	X
Thrombolytics		X	X
Ticagrelor		X	X

Procedures

Procedure	Tier I	Tier II	Tier III
Chest Tube	X (Monitor)	X	X
ECMO			X
Intra-Aortic Balloon Pump			X
IV Pump	X	X	X
PCA Pump	X (Monitor)	X	X
Ventilator		X	X

Tier Requirements

	Tier I	Tier II
Licensure	Must be a licensed EMT-Paramedic or PHRN who is approved by the EMS System	Must be licensed EMT-Paramedic or PHRN with training more comprehensive than Tier I expanded scope of practice
Minimum Staffing	1 – EMT – B, AEMT (EMT-I) or Paramedic/PHRN as driver 1 – Paramedic/PHRN with advance scope of practice who is with the patient at all times	1 – Paramedic/PHRN and 1 – Paramedic/PHRN who is critical care trained and remains with the patient the entire time It is appropriate to have a EMT-B or I as driver as long as the first 2 conditions are met
Initial Education	Documentation of initial education and demonstrated competencies of expanded scope of practice skills required for Tier I and approved by EMS System	80 hours of established higher collegiate education or equivalent critical care education based on existing university program models. The program must meet or exceed the University of Maryland Baltimore County (UMBC) Critical Care Paramedic guidelines/curriculum
Continuing Education	Annual competencies of expanded scope including knowledge of protocols, policies, procedures, equipment, and skills	Must maintain certifications as listed below. 12 hours of critical care level education annually. Must maintain an active critical care certification.
Certifications	Shall maintain active ACLS, PEPP or PALS, ITLS or PHTLS	Shall maintain, active ACLS, PEPP or PALS, ITLS or PHTLS.
Experience	Minimum 1 year ALS experience	Minimum of two years' experience functioning in the field at an ALS level for paramedic or PHRN.

	Tier III
Licensure	Licensed Illinois Paramedic or PHRN
Minimum Staffing	1 – EMT – B/I/P as a driver 1 – EMT-Paramedic or PHRN who is critical care trained and 1 – Registered RN
Initial Education	Paramedic or PHRN a. 80 hours of established higher collegiate education or equivalent critical care education based on existing university program models. The program must meet or exceed the University of Maryland Baltimore County (UMBC) Critical Care Paramedic

	guidelines/curriculum. They must also be approved by the EMS System.
Continuing Education	Must maintain certifications as listed below. 12 hours of critical care level education annually. Must maintain an active critical care certification.
Certifications	Shall maintain active ACLS, PEPP or PALS, ITLS or PHTLS
Experience for EMT-P/PHRN	Minimum 3-year ALS experience, documented competencies, and completion of annual competencies of expanded scope knowledge, equipment, and procedures
Education, Experience, Certification for Nurse	Minimum 2 years' experience with demonstrated competencies in critical care
Nurse Certifications	ACLS, PALS or PEPP or ENPC, ITLS or PHTLS or TNCC or TNS and ECRN or equivalent

Notes

All medication infusions should be administered with Normal Saline or D5W, unless otherwise specified by physician orders.

Note that all levels of Critical Care protocols cannot be used during routine 911 calls. These protocols are meant for interfacility transfers only.

System Approval

For a provider to qualify for Tier I, II or III, they must turn in all documentation to the EMS System demonstrating completion of required education and associated certifications per their level. Providers must all pass a critical care protocol written protocol at their level as well. Each provider must be approved by the EMS System Medical Director or designee prior to allowing that provider to practice under these protocols.

Agencies must turn in appropriate documentation demonstrating annual competencies and that providers are maintaining education in accordance with the requirements stated above. Providers who maintain qualifications will receive system Critical Care approval (based on tier). Failure to do so will result in the provider loosing system critical care credentials.

Tier I Standing Orders

Tier I agencies are largely restricted to monitoring the medications and procedures that are included in the following pages. Tier I paramedics and agencies may only monitor or administer medications that are contained within either standard formulary for ALS agencies in the McLean County Area EMS System, or that are included in this Tier I portion of the critical care plan.

Tier I status only applies if the paramedic rendering treatment has gone through expanded scope training and is familiar with the relative indication, contraindications, and side effects of each of the expanded scope medications and/or procedures. Paramedics should never take an interfacility transfer, which will utilize a medication or an intervention with which they do not feel comfortable.

Acetaminophen (Tylenol)

Usage:

For patients experiencing minor to moderate pain or fever

Complications/Adverse Reactions:

Nausea, stomach discomfort, excessive sweating, dark urine, jaundice

Contraindications:

Hypersensitivity, Hepatic failure or disease,

Standing Orders for Administration by Transferring Facility:

1) Verify dosage with sending physician.
2) Typical Adult Dosage:
    i. IV – 1000mg IV every 6 hours or 650mg IV every 4 hours (24 hour max of 4000mg)
    ii. Oral – 325 mg to 1 g every 4-6 hours (24 hour max of 4g)
3) Typical Pediatric Dose – See physician orders

Cardizem (Diltiazem)

Usage:

Atrial fibrillation with rapid ventricular response, atrial flutter; Paroxysmal Supraventricular Tachycardia (PSVT'}

Complications/Adverse Reactions:

CNS dizziness, parenthesis, headache, weakness, visual disturbance.

CV: hypotension, facial flushing, junctional or AV dissociation, chest pain, congestive heart failure, ventricular or atrial arrhythmias, edema

Dermatologic: injection site reaction (itching, burning), sweating

GI: constipation, nausea, vomiting, dry mouth

Contraindications:

Patients with sick sinus syndrome (expect in presence of a ventricular pacemaker), patient's with a second or third degree AV heart block (expect in the presence of a ventricular pacemaker), patients with hypotension (under 90 mm Hg systolic), patients with hypersensitivity or patients with acute myocardial infarction and pulmonary edema.

Equipment Maintenance:

All Cardizem drips must be administered via an infusion pump and will be initiated at transferring hospital.

Standing Orders for Administration by Transferring Facility:

4) Verify concentration, dosage, and VS parameters on physician's order sheet from transferring hospital. (Usual dose is 125 mg/ 100 cc NS or D5W or D5 45 NS; this yields 1 mg/min delivered dose)

5) Monitor vital signs: B/P, pulse rate every 15 minutes with continuous EKG monitoring.

6) Notify Medical Control of the vital signs (heart rate < 110 / > 150, or Systolic BP <90) deviate from the predetermined parameters set forth by the transferring hospital.

7) Notify Medical Control of any AV block.

Dilaudid (Hydromorphone hydrochloride)

Usage:

For narcotic analgesic effects and as indicated for the relief of moderate to severe pain.

Complications/Adverse Reactions:

More common side effects may include anxiety, constipation, dizziness, drowsiness, fear, impairment of mental and physical performance, inability to urinate, mental clouding, mood changes, nausea, vomiting, restlessness, sedation, troubled and slowed breathing.

Less common side effects may include agitation, blurred vision, chills, cramps, diarrhea, and weakness.

Contraindications:

Known hypersensitivity to drug or narcotic painkillers, pregnant or nursing mothers. Caution should be used in patients who have taken other central nervous depressants, narcotic analgesics, sedative/hypnotics, or tricyclic antidepressants.

Equipment Maintenance:

May be given IV push per physician order.

Standing Orders for Administration by Transferring Facility:

1) Verify drug, dose, and route of administration.

2) Dilaudid PCA must be run through a PCA pump. Refer to compatibility chart before pushing Dilaudid through an infusing IV. If no IV is established, begin NS or LR at TKO rate.

3) Push IV dose over 1-2 minutes.

4) Monitor vital signs; if respiratory depression or hypotension occur, administer Narcan per standing MCAEMS protocol.

5) Monitor pain scale before and after treatment.

H2 Blockers (Zantac/ranitidine, Pepcid/famotidine, Tagamet/cinetodine)

Usage:

Intractable duodenal ulcers, GI bleeding, prevention of ulcers in patients in a high stress state such as a critical illness, gastric ulcers, Zollinger-Ellison.

Complications/Adverse Reactions:

Bradycardia with rapid administration

Malaise, vertigo, reversible confusion, tachycardia, bradycardia, constipation, nausea, vomiting, rash, muscle cramping.

Contraindications:

No absolute contraindications, should be used with caution with patients with hypersensitivity

Equipment Maintenance:

H2 Blockers need to be run through an infusion pump

Standing Orders for Administration by Transferring Facility:

1. Bolus infusions: initial dose must have been administered at transferring hospital
2. Continuous infusions will be started at the transferring hospital.
3. Verify dosage, concentration prior to leaving transferring hospital,

Unusual dosage:

Zantac bolus: 50 mg to be run over 30 minutes every 6-8 hours.

Zantac Continual Infusion: 150 mg Zantac in 250 cc NS (typical rate 10 cc/hr)

Pepcid bolus: 20 mg every 12 hours

Tagamet: 300 mg bolus every 6 - 8 hours

Heparin

Usage:

Concurrent usage with administration of TPA in the acute MI patient. Treatment of pulmonary embolism, atrial fibrillation with embolization. Treatment of peripheral arterial embolism

Treatment of venous thrombi and its extension.

Complications/Adverse Reactions:

Hemorrhage, local site irritation, hypersensitivity, anaphylactic like reaction, adrenal hemorrhage

Contraindications:

Severe thrombocytopenia Uncontrolled active bleeding (except when known to be from disseminated intravascular coagulation).

Equipment Maintenance:

IV solution must be infused via an infusion pump

Standing Orders for Administration by Transferring Facility:

1. Routine cardiac care
2. Verify initial dose concentration, and infusing rate as well as total time at transferring facility prior to departure.
3. Assess labs prior to transfer if available: H&H, platelets, PTI,
4. Heparin infusion must be initiated at the transferring hospital.
5. Rates of infusion should not be changed unless ordered.

Unusual concentrations of heparin:

25,000 units in 500cc yields 50 units/cc

25,000 units in 250 cc yields 100 units/cc

Hyperalimentation (TPN, PPN)

Usage:

Hyperalimentation provides nutrition for patients unable to inject or tolerate oral or enteral feedings.

Complications/Adverse Reactions:

Infection, Hyperglycemia, hyperosmolar syndrome, electrolyte disturbance and post infusion syndrome.

Contraindications:

Severe thrombocytopenia Uncontrolled active bleeding (except when known to be from disseminated intravascular coagulation).

Equipment Maintenance:

Hyperalimentation must be administered via an infusion pump.

Standing Orders for Administration by Transferring Facility:

1. Verify solution formula and rate with physician's order prior to transport
2. Hyperalimentation is to be considered incompatible with all other medications and IV solutions. Nothing is to be added to the hyperalimentation bag or IV tubing.
3. Monitor for signs and symptoms of hyper/hypoglycemia. Obtain blood sugars needed. **CONTACT MEDICAL CONTROL** if symptoms appear.
4. If a port of a central line is leaking or cracked, clamp off port, start peripheral IV and **CONTACT MEDICAL CONTROL** for IV fluid orders.

Ibuprofen (Motrin)

Usage:

For patients experiencing minor to moderate pain or fever

Complications/Adverse Reactions:

Nausea, stomach discomfort, excessive sweating, dark urine, jaundice

Contraindications:

Hypersensitivity, asthma, urticaria or patients with peri-operative pain in the setting of coronary artery by-pass surgery.

Standing Orders for Administration by Transferring Facility:

1. Standard Adult Dose
    a. 400mg every 4 to 6 hours
2. Pediatric Dosage
    a. See physician orders

IV Antibiotics

Usage:

To treat pre-existing infections or as a prophylactic measure in patients that are at high risk of developing an infection.

Complications/Adverse Reactions:

Allergic reactions: rash, swelling, nausea, vomiting, diarrhea, chills, fever, laryngeal edema, anaphylaxis. Leukopenia, Ototoxicity, and nephrotoxicity (aminoglycocides). Too rapid of administration may increase complications

Contraindications:

None when used appropriately. Allergies to antibiotics

Equipment Maintenance:

Antibiotics administered by Tier I Paramedics must be infused through a pump.

Standing Orders for Administration by Transferring Facility:

1. Initial dose of the IV antibiotic must be administered at the transferring hospital prior to transfer. Transferring hospital may order and provide additional IV antibiotics to infuse during long distance interfacility transfer.
2. Known allergies must be assessed prior to administrating the antibiotics
3. Verify drug, dose, route, and time of the administration from the transfer order sheet
4. Infuse IV antibiotics as specified on the physician's order or hospital pharmacy directions.
5. Monitor for signs and symptoms of an allergic response. If any symptoms are noted, stop infusion and contact base station physician
6. If IV antibiotics have finished infusing enroute, keep line open with NS KVO or LR KVO
7. Review drug compatibility chart.

IV KCL

Usage:

To replace serum potassium that may be depleted from a disease state or from fluid resuscitation Maintains neuromuscular excitability of cardiac, smooth, and skeletal muscles.

Complications/Adverse Reactions:

Local irritation, burning along the vein of infusion, Nausea, vomiting, abdominal pain. Weakness in legs

In high concentrations: flushing, agitation, hypotension and diaphoresis Peripheral vascular collapse EKG changes associated with potassium intoxication:

1. Tall tented T waves
2. Depressed S-T segments
3. Prolonged P-R interval, loss of P-wave
4. Heart block, v-fib, cardiac arrest

Be careful not to infuse the fluid too rapidly

Contraindications:

None when used appropriately. Allergies to medication

Equipment Maintenance:

IV solution should be infused via an infusion pump

Standing Orders for Administration by Transferring Facility:

1. IV potassium infusion must be initiated at the transferring hospital and may be run through either central or peripheral line.
2. KCL concentrations may not exceed 44meq KCL in 1 liter of IV solution. NO KCL will be initiated in the field.
3. Refer to compatibility chart before administering any IV mediations through an IV containing potassium.
4. Monitor for any signs and symptoms of potassium intoxication. Stop infusion and notify base station physician of symptoms.
5. Monitor urinary output. Notify base station physician if urinary output is less than 30 cc per hour for 2 consecutive hours.
6. Assess IV insertion site for any redness, swelling or tenderness. If any of the above occurs, stop infusion, and discontinue IV site. Restart infusion after a new IV site has been established. Notify receiving hospital of the area of the previous IV site.

Lasix (Furosemide) Infusions

Usage:

Congestive heart failure and acute renal failure that is unresponsive to bolus treatments.

Complications/Adverse Reactions:

Digitalis toxicity, hypokalemia, ventricular ectopy, ototoxicity, electrolyte imbalance, esp. potassium and magnesium

Hypotension, vertigo, tinnitus, hearing loss, rash, weakness, muscle spasm, photosensitivity, ventricular ectopy.

Contraindications:

None when used appropriately. Hypersensitivity to medication.

Equipment Maintenance:

Lasix infusions must be run through an infusion pump.

Standing Orders for Administration by Transferring Facility:

1. Infusion must be started at the transferring hospital
2. Verify concentration, infusion rate and VS parameters prior to leaving transferring hospital.
3. Assess serum potassium levels prior to transfer if available.
4. Monitor and document VS at least every 15 minutes while in transit.
5. Notify Medical Control if B/P drops below 15% of initial baseline.
6. Monitor EKG. Notify Medical control or receiving physician of any new onset or increase ventricular ectopy or tachycardia or signs and symptoms of adverse reaction (see above)
7. Common dosage: 250mg of Lasix in 250 cc of NS yielding 1 mg/cc. Maintenance dose 1-4mg/kg/hr not to exceed 4mg/min.
8. Do not give IV bolus medications through the Lasix infusion

Normal value: Serum K+ = 3.5 – 5.0

Morphine Sulfate

Usage:

Relief of severe pain

Complications/Adverse Reactions:

Sedation, somnolence, euphoria, hypotension, bradycardia, respiratory depression

Contraindications:

Hypotension, allergy

Equipment Maintenance:

May be given IV push. Morphine Sulfate drips must be administered through an infusion pump. Morphine sulfate PCA through a PCA pump.

Standing Orders for Administration by Transferring Facility:

1. Morphine Sulfate drip will be initiated at transferring hospital
2. Monitor vital signs every 5 minutes: if respiratory depression, somnolence, or hypotension occurs, contact base station physician.
3. Refer to compatibility chart before infusing any drug through the morphine drip.
4. Consult with base physician for dose adjustment if morphine drip is not effective in managing pain.
5. Monitor pain scale before and after treatment.

Multi-Vitamin IV Additive (MVI)

Usage:

To replace vitamin deficiency in those patients suffering from a chronic disease state this route is utilized when oral administration is not possible.

Complications/Adverse Reactions:

WARNING: This product contains aluminum that may be toxic. Aluminum may reach toxic levels with prolonged parenteral administration if kidney function is impaired. Premature neonates are particularly at risk because their kidneys are immature, and they require large amounts of calcium and phosphate solutions, which contain aluminum.

Research indicates that patients with impaired kidney function, including premature neonates, who receive parenteral levels of aluminum at greater than 4 to 5 mcg/kg/day, accumulate aluminum at levels associated with central nervous system and bone toxicity. Tissue loading may occur at even lower rates of administration.

Studies have shown that vitamin A may adhere to plastic, resulting in inadequate vitamin A administration in the doses recommended with M.V.I.–12®.

Thiamine and folic acid cause irritation at IV site.

Contraindications:

None when used appropriately, hypersensitivity

Standing Orders for Administration by Transferring Facility:

1. Infusion containing multi-vitamin is to be initiated at the transferring hospital. Rate of infusion will be documented before transfer
2. Refer to compatibility chart before administering any IV medication through the IV infusion containing the multivitamin additive
3. The multi-vitamin dose must be diluted in a solution of 500-1000cc of LR, NS or D5
4. May be administered in same IV as KCL
5. Assess IV insertion site for any redness, swelling or tenderness
6. If above occurs; STOP infusion and discontinue IV. Restart infusion if a new IV site has been established. Notify receiving hospital of the area of the previous IV site.

Nitroglycerin Infusion

Usage:

The principal pharmacological action of nitroglycerin is relaxation of vascular smooth muscle and consequent dilation of peripheral arteries and veins.

Complications/Adverse Reactions:

Headaches, dizziness, weakness, nausea, vomiting, hypotension, tachycardia, and palpitations

Contraindications:

Hypotension, hypersensitivity

Equipment Maintenance:

All nitroglycerin infusion must be administered via an infusion pump

Standing Orders for Administration by Transferring Facility:

1. Verify concentration, dosage and vital sign parameters on physician's order sheet from the transferring hospital.
2. Nitroglycerin infusions must be in a glass bottle and polyethylene tubing
3. Monitor vital signs: B/P and heart rate at least every 15 minutes when transporting a patient with a nitro drip
4. Notify Medical Control if vital signs deviate from the predetermined parameters set forth by transferring physician.
5. Notify Medical Control if chest pain reoccurs while transporting to facility (usually if systolic is <90)
6. Nitroglycerin infusion must have a separate IV site. No IV push drugs can be administered through this line

Norepinephrine

Usage:

The principal pharmacological action of Norepinephrine (Levophed) is a peripheral vasoconstrictor.

Complications/Adverse Reactions:

Headaches, dizziness, weakness, nausea, vomiting, hypotension, tachycardia, and palpitations

Contraindications:

Should not be given to patients with mesenteric or peripheral vascular thrombosis.

Equipment Maintenance:

All norepinephrine infusions must be administered via an infusion pump

Standing Orders for Administration by Transferring Facility:

1. If patient is hypotensive (SBP <90 mmHg) and fluid boluses were not successful, began infusion at 2mcg/min and titrate to a SBP>90mmHg. Max dose of 12mcg/min
2. If dose is maxed out and patients SBP < 90mmHg, contact Medical Control for further guidance.

Tier II Standing Orders

Medical Equipment and Supplies:

1. Ventilator
2. Infusion Pumps

Vehicle Standards

1. Vehicle must comply with all IDPH and EMS system vehicle licensing requirements. Failures to comply could result in removal of Tier II status.

Quality Assurance Program

1) The Tier II transport provider shall develop a written QA Plan approved by the EMS System and the Department. The participating provider shall provide quarterly reports to the assigned EMS Resource Hospitals for the first 12 months of operation.
2) The EMS System shall establish the frequency of quality reports after the first year if the System has not identified any deficiencies or adverse outcomes.
3) The EMS Medical Director shall oversee the QA Program.
4) The QA Plan shall evaluate all expanded scope of practice activity for medical appropriateness and thoroughness of documentation. The review shall include:
    a. Review of transferring physician orders and evidence of compliance with those orders;
    b. Documentation of vital signs and frequency, and evidence that abnormal vital signs or trends suggesting an unstable patient were appropriately detected and managed;
    c. Documentation of any side effects/complications, including hypotension, extreme bradycardia or tachycardia, increasing chest pain, dysrhythmia, altered mental status and/or changes in neurological examination, and evidence that interventions were appropriate for those events;
    d. Documentation of any unanticipated discontinuation of a catheter or rate adjustments of infusions, along with rationale and outcome;
    e. Review of any Medical Control contact for further direction;
    f. Documentation that unusual occurrences were promptly communicated to the EMS System; and
    g. An analysis of any event or care inconsistent with standards. The EMS System educator shall assess and carry out a corrective action plan

Tier II Standing Orders Policy Statement

The following Standing Medical Orders (SMOs) are established and designed to assist the Critical Care transport team during the transport of patients meeting the definition of a Tier II or greater per IDPH established standards. Standing Medical Orders represent the optimal standards of care for patients to ensure uniformity and continuity of healthcare delivery. For any treatment protocols not addressed in these SMOs, patient care will be in provided following the McLean County Area EMS System Protocols/SMOs utilized by 911 paramedics.

During transport, the EMS Medical Director or Medical Control Physician is not always easily accessible. Transport often requires the team members to function independently utilizing their own critical care assessment, judgment, and skills knowledge in delivering patient care. These medical protocols represent the accepted guidelines of medical care for the majority of the illnesses encountered by the transport teams. It is recognized that there may be situations in which there is no medical protocol addressing a specific complex or difficult medical situation and, in this instance, every effort is made to contact the transferring physician, receiving physician, EMS Medical Director or Medical Control Physician to assist in medical decisions. The Prehospital Run Report completed after each transport is a part of the patient's medical record and reflects all care delivered during transport.

Standing Medical Orders are written in an algorithm or step outline form for each medical subject. It is expected that, as the transport crew proceeds through a given algorithm/outline, they will continually re-evaluate the patient for any status change in his/her condition, and assess the outcome of any therapeutic interventions. Documentation of patient assessments are clearly and carefully recorded with attention to: (1) the patient's condition before and after the treatment protocols, (2) treatment(s), (3) the time of treatment, and (4) patient outcome of treatment.

Critical Care Protocols serve as an adjunct to patient care in the inter-hospital setting. All crew are expected to be familiar with these protocols, McLean County Area EMS System protocols and demonstrate proficiency in such knowledge through successful testing and passing of the protocol exam.

General Patient Assessment

Purpose/Goal: To identify a systematic approach for all patient assessments prior to transport.

1. Obtain a verbal report from the ED RN or MD, including prior treatment, lab values, ABGs (if applicable), and response to treatment.
2. Initial assessment: Primary Survey
   a. Airway – assess patency and potential for spinal injury.
   b. Breathing – Assess for respiratory distress, bilateral chest expansion, rate, pattern and depth of ventilations, adequacy of respirations, use of accessory muscles and lung sounds.
   c. Circulation – Assess rate, quality and regularity of pulses, skin condition, hemodynamic status, and neck veins.
   d. Disability – Brief neuro exam, include a brief pupil check.
      - A = Alert
      - V = Verbal
      - P = Painful stimuli
      - U = Unresponsive
   e. Expose: remove clothing or conduct focused exam of patient.
3. Perform a secondary survey to include:
   a. History of Present illness/reason for transfer.
   b. Vital signs, Glasgow Coma Score, and Revised Trauma Score (if applicable)
   c. Past medical history, current medications, allergies, and treatments performed and the transferring institution (if feasible and applicable).
   d. Detailed exam/secondary survey.
   e. Current level of pain using the numeric score for adults and the “faces” score for children. If unable to have patient rate his/her pain due to level of consciousness, please make note in the documentation.
   f. Vital signs are to be performed at the crew’s discretion. Every 15 minutes is a guideline for patients during transport but may be more frequently if warranted. Stable patients will have vitals obtained at a minimum of every 20 minutes.

Acute MI

Purpose/Goal: To establish treatment parameters for the patient experiencing an acute MI and/or chest pain.

Routine Cardiac Care:

1. Administer Oxygen
   a. 4 liters/minute per nasal cannula
   b. 15 liters/minute by non-rebreather mask for marked dyspnea (if the patient tolerates the mask).
   c. If oxygen saturation is above 94% oxygen may not be indicated
2. Administer ASA 324 mg PO if not contraindicated or already given.
3. Administer or confirm administration of anti-platelet agent with MD order
   a. Plavix (Clopidogrel) 600mg PO
      i. If patient is already on Plavix administer 300mg PO
   b. Brilinta (Ticagrelor) 180mg PO
   c. Effient (Prasugrel) 60mg PO
      i. Contraindicated if history of TIA/Stroke, weight < 60kg or age 75 or older
4. Beta-blocker administration should be considered for hypertension (systolic > 180 and/or diastolic > 100mg). CCT crew may administer the Beta Blocker IVP with order from transferring physician.
   a. Hold beta blocker for heart rate < 50, AV block, SBP < 100
5. If systolic BP above 90 mmHg, may give Nitroglycerin spray 0.4 mg metered dose spray *or* tab sublingually. May repeat every 5 minutes as needed. If pain relieved with sublingual NTG, consider applying 1 inch Nitro paste to anterior chest wall. For continued pain, consider NTG infusion at 5-50 mcg/minute. Titrate every 5 minutes to pain and SBP >100 mmHg. Maximum recommended rate: 100mcg/min. While titrating NTG, also consider narcotics for pain.
6. Heparin 4000u bolus IV if not previously administered. Heparin may be administered by CCT crew with an order from the transferring physician
   a. Contraindications to heparin infusion include: GI bleed, bleeding disorder, Coumadin therapy with therapeutic INR, Lovenox therapy, intracranial or intraspinal event within 3 months, or major surgery or trauma within 14 days.
7. Consider narcotics for on-going/continued pain.
   a. Fentanyl: 1-2 mcg/kg IV given over 2 minutes. Titrate every 15 - 30 minutes to maximum total dose of 5 mcg/kg.
   b. Dilaudid: 0.5 mg – 1 mg IV for pain, given over 1-2 minutes. May be repeated every 15 minutes for a maximum total dose of 4 mg.
   c. Morphine Sulfate: 2-5 mg IV for pain. May be repeated every 5 minutes if the systolic blood pressure > 90 mmHg, to a maximum total dose of 10 mg.
8. Continue with infusion of thrombolytics if initiated by referring hospital. Verify dosage of thrombolytics
9. Stop infusion for anaphylactic reaction or serious bleeding occurs.
10. Treat symptomatic arrhythmias per protocol.

Note: Please remember that with thrombolytics, reperfusion arrhythmias are not uncommon and as long as the patient's vitals are stable and they are not having clinically significant symptoms, the arrhythmias are best left alone.

Contraindications for Thrombolytics or IIb IIIa

Absolute

a. Any prior intracranial hemorrhage or CVA within 3 months
b. Known structural cerebral vascular lesion (AVM)
c. Known malignant intracranial neoplasm (primary or metastatic)
d. Suspected aortic dissection
e. Active bleeding or bleeding diatheses (excluding menses)
f. Significant closed-head trauma within 3 months

Relative

- History of chronic, poorly controlled hypertension (SBP > 180 or DBP >110)
- Systolic BP >200
- Recent (within 3 weeks) internal bleeding
- Current use of coumadin
- Men > or equal to 80 years old
- Women > or equal 75 years old
- Low body weight
- Major surgery in the last 3 weeks
- Pregnancy
- Serious systemic disease (advanced, terminal cancer, liver or kidney disease)
- Traumatic or prolonged CPR (greater than 10min)
- Bleeding peptic ulcer within 1 month

General Acute Coronary Syndrome/Chest Pain

Purpose/Goal: To establish treatment parameters for the patient experiencing an acute coronary syndrome and/or chest pain.

1. Routine cardiac care.
2. Administer Oxygen
   - 2-4 liters/minute per nasal cannula
   - 15 liters/minute by non-rebreather mask for marked dyspnea (if the patient tolerates the mask).
   - If oxygen saturation is above 94% oxygen may not be indicated
3. Administer ASA 324 mg PO if not contraindicated or already given.
4. Administer or confirm administration of anti-platelet agent with MD order. Should not be given if patient has known multi-vessel disease or Coronary Artery Bypass Grafting is planned
   - Plavix (Clopidogrel) 600mg PO (If patient is already on Plavix administer 300mg PO)
   - Brilinta (Ticagrelor) 180mg PO
   - Effient (Prasugrel) 60mg PO

Note: Contraindicated if history of TIA/Stroke, weight < 60kg or age 75 or older

5. If systolic BP above 90 mmHg, may give Nitroglycerin, 0.4 mg metered dose spray or tab sublingually. May repeat every 5 minutes. If pain relieved with sublingual NTG, may apply 1 inch Nitropaste to anterior chest wall.
6. For continued pain, consider NTG infusion at 5-20 mcg/minute. Titrate every 5 minutes to pain and SBP >100 mmHg. Maximum recommended rate: 100mcg/min. While titrating NTG, also consider narcotics for pain.
   a. Fentanyl: 1-2 mcg/kg IV given over 2 minutes. Titrate every 15 - 30 minutes to maximum total dose of 5 mcg/kg.
   b. Dilaudid: 0.5 mg – 1 mg IV for pain, given over 1-2 minutes. May be repeated every 15 minutes for a maximum total dose of 4 mg.
   c. Morphine Sulfate: 2-5 mg IV for pain. May be repeated every 5 minutes if the systolic blood pressure > 90 mmHg, to a maximum total dose of 10 mg.
7. If patient has active chest pain, hypotension SBP <90, or hypertension SBP >180 and/or DBP >100 notify receiving physician while expediting transfer process.
8. Heparin guidelines:
   a. If thrombolytics have been given, heparin should be infusing unless contraindicated or specified by physician. Heparin may be initiated by CCT crew with an order from the transferring or receiving physician.
   b. Contraindications to heparin infusion include: GI bleed, bleeding disorder, Coumadin therapy with therapeutic INR, Lovenox therapy, intracranial or intraspinal event within 3 months, or major surgery or trauma within 14 days.
   c. Heparin should not be started if concerned about aortic dissection.
   d. Heparin dosing:
      i. Bolus 60 units/kg (maximum 4000 units IV)
      ii. Infusion 12 units/kg/hour (maximum 1000 units/hour)

Cardiac Arrest

Purpose/Goal: To establish treatment Critical Care parameters for the patient in cardiac arrest.

1. Patients suffering cardiac arrest in the CCT arena will be treated in accordance with the McLean County Area EMS System current protocols.

Bradycardia

Purpose/Goal: To establish treatment parameters for the patient with a bradycardic rhythm.

1. Apply pacing patches/external pacing monitor, if indicated.
2. Observation with continuous reassessment, if patient is asymptomatic as demonstrated by:
   a. patient alert
   b. skin warm and dry
   c. Systolic BP 90 or greater and stable, and
   d. Heart rate greater than 30
3. Initiate treatment if the patient has a HR < 50 and is symptomatic as demonstrated by one or more of the following:
   a. Confusion/lethargy, diaphoretic/pale, light-headed/shortness of breath (or) chest pain.
   b. Systolic blood pressure < 80

Treatment for symptomatic bradycardia:

1. Administer Atropine 0.5 mg IV push (every 5 minutes to a total dose of 3 mg).
2. If patient is in extremis, initiate external pacing per protocol. (See Use of External Pacemaker procedure)
3. Initiate a Dopamine or Levophed infusion, titrated to keep a SBP of 90. If no blood pressure *or pulse* is obtainable, refer to PEA protocol.
4. If no response to Atropine, pacing, Dopamine or Levophed, and patient is in extremis, consider Epinephrine infusion: 1 mg in 250 ml D5W. Infuse at 2-10 mcg/min. Maximum dose 20 mcg/min (See Appendix D). Consider Push Dose Epi as alternative per medication guide to increase heart rate 10mcg every 5 minutes.

Levophed dosing – Should be set by transferring physician prior to departure. If need during transport ensure fluid boluses are administered appropriately. If SBP<90mmHg, begin Levophed infusion at 2mcg/min and titrate to a SBP>90mmHg. Max dose of 12mcg/min

Dopamine dosing - Should be set by transferring physician prior to departure. If need during transport ensure fluid boluses are administered appropriately. If SBP<90mmHg, begin at 5mcg/kg/min and titrate to a SBP>90 mmHg. Max dose of 20mcg/kg/min

Push Dose Epinephrine - To make Push Dose Epinephrine, take 1x 10ml Saline flush and waste 1ml of saline. Draw 1ml of 1:10,000 Epinephrine into the 9ml Saline flush. The mixture now has 10mL of epinephrine at 0.01mg/ml (10mcg/ml) concentration.

External Pacemaker Procedure

Purpose/Goal: To establish parameters for use of the External Pacemaker

Indications for the use of External Pacemaker:

- Symptomatic bradycardia, second degree type II heart block, or third (3rd) degree heart block with heart rate less than 50.
- Symptoms may include: hypotension (BP <80), PVC's, confusion/lethargy, diaphoresis, chest pain, dyspnea, ischemia, or infarction.

Procedure:

1. Place pacemaker pads on patient and confirm patient is on 4 lead monitoring as well. Attach pacemaker cable to monitor.
2. If pacemaker is needed:
   a. Turn on pacemaker mode
   b. Set the rate to 70
   c. Begin at 70 mAmp. Increase amperage until mechanical capture is obtained and the patient's pulse synchronizes with the pacer spikes.
   d. Once mechanical capture is achieved, increase the amperage 10mAmp higher.
   e. Also consider increasing the rate to increase cardiac output.
3. For continued anxiety:
   a. Fentanyl 1-2 mcg/kg IVP. Repeat every 5 minutes x 3, OR
   b. Versed 0.05 – 0.1 mg/kg IV over several minutes and titrate. Wait an additional 2 minutes before administration of an additional dose. May repeat x2.

Intra-Aortic Balloon Pump Therapy

Purpose/Goal: To outline guidelines and procedures for transport of patients with intra-aortic balloon pump therapy (IABP). These transports are considered Tier III and may only be completed by tier II agencies with the assistance of a RN and/or perfusionist.

Procedure:

Initial Assessment

1. Routine cardiac care.
2. Assess vital signs, including hemodynamic parameters as available at least every 15 minutes or more frequent according to patient condition.
3. Administer oxygen
   a. 2-4 L/min by nasal cannula
   b. 15 L/min by non-rebreather mask for marked dyspnea (if patient tolerates mask)
   c. Intubate as needed.
4. Assess insertion site for bleeding and make sure tubing is positioned to prevent kinking.

Transfer to the transport IABP

1. The patient will be transferred to the transport IABP by the provider who will:
   a. Monitor the pump function including:
      - appropriate trigger
      - clear EKG signal with optimal R wave amplitude
      - alarm function
      - observation of tubing for blood and condensation
      - adequate helium supply
      - correct timing
      - augmentation ratio
      - auto mode
      - confirm battery power
2. Assess for optimal balloon timing hourly and when the following situations occur:
      - HR change of 20%
      - EKG rhythm change
      - Alarm alert
      - Hypotension

Monitoring and treatment of patient during transport

1. Inspect the IABP hourly for signs of blood (may appear like flecks of black pepper).
2. Monitor insertion site anteriorly and posteriorly for ecchymosis, hematoma and bleeding every 15 minutes post insertion for the first hour, then hourly.
3. Monitor extremities for perfusion upon initial assessment and every hour thereafter unless otherwise ordered. Monitor the following:
      - presences of pulses X4 extremities
      - capillary refill
      - movement
      - color

- warmth
- sensation

4. Assess neurological status, including motor function and level of consciousness every 15 minutes.
5. Maintain bedrest and position by logrolling side to side if stable. Do not elevate head of bed > 30 degrees.
6. Prevent hip flexion in the involved extremity and consider immobilization of the limb as necessary with knee immobilizer.
7. Inflate and deflate the balloon manually with a syringe and stopcock every 3-5 minutes if balloon pump is unable to inflate.
8. Place pump on pressure trigger during cardiac arrest.
9. For persistent hypotension not responsive to adjustment of balloon pump settings, see cardiogenic shock protocol.
10. Document abnormal assessments and initiation of emergency interventions.
11. The RN and/or perfusionist/provider shall document his/her interventions and settings per their standards and protocol.
12. Contact receiving physician for further orders.

Cardiogenic Shock

Purpose/Goal: To establish parameters for treatment for those patients with cardiogenic shock.

1. Routine cardiac care. In case of MI, expedite travel for percutaneous coronary intervention.

2. Establish IV of 0.9% N.S. or LR – Administer fluid boluses as needed if patient is not symptomatic for congestive heart failure (CHF). Signs would include: SOB, crackles, rhonchi, wheezing. May repeat fluid bolus PRN. In the case of known inferior or right ventricular MI, may bolus up to 1-2 liters in the face of persistent hypotension.

3. Stop NTG infusion. Remove NTG paste.

4. Initiate Norephinephrine infusion. Dosing start at 2mcg/min and titrate to SBP > 90mmHg.
   - Norepinephrine dosing: 2-12 mcg/min. May require up to 30 mcg/min. Mix *8* mg in 250 ml of D5W.
5. For bradycardic patients or those without adequate response to Norephinephrine initiate Dopamine infusion (SBP < 90). Start at 5 mcg/kg/min, titrating infusion to achieve SBP > 90mmHg. Maximum dose is 20 mcg/kg/min. Consider Push Dose Epienphrine 10mcg every 5 minutes for patients who are bradycardic.

6. Dobutamine may be considered with physician order, provided by the transferring facility. Dosing 5 mcg/kg/min titrating to 20 mcg/kg/min.

7. For ventricular or atrial arrhythmias, Amiodarone is the preferred anti-arrhythmic. If using Lidocaine for ventricular arrhythmias, consider using lower dose especially for those over 65 years old, or those who have a history of renal disease.

Atrioventricular Blocks

Purpose/Goal: To establish parameters for treatment of patients with AV blocks.

1. First Degree AV Block
   a. Routine cardiac care
   b. Apply external pacing patches *(if symptomatic)*
   c. Observe for progression of heart block

2. Second Degree AV Block
   a. Routine cardiac care
   b. Apply external pacing patches
   c. Observation only, if:
      - Patient alert (and)
      - Skin warm and dry
      - Systolic BP 80 or greater and stable (and)
      - Heart rate > 50
   d. Giving Atropine for 2nd Degree Type II AV Block is a relative contraindication.
   e. If symptomatic refer to Bradycardia and External Pacemaker protocols.

3. Third Degree AV Block
   a. Routine cardiac care
   b. Apply external pacing patches
   c. If asymptomatic, monitor closely
   d. If symptomatic, consider a single dose of Atropine 0.5 mg IV/IO
   e. If symptomatic, begin pacing immediately with external pacer
   f. Refer to Bradycardia and External Pacemaker protocols.

Narrow Complex Tachycardia

Purpose/Goal: To identify treatment parameters for those patients presenting with Narrow Complex Tachycardias (QRS <0.12 seconds).

Initiate routine cardiac care and monitor all patients carefully. Patients are rarely symptomatic with heart rate less than 150 bpm.

1. Unstable Narrow Complex Regular Tachycardia
   a. Oxygen, IV/IO access, fluid bolus as indicated for hypotension.
   b. If at any point, patient becomes unconscious and/or pulseless, treat as V-fib.
   c. Consider Versed 0.05-0.1 mg/kg IV
   d. Consider Adenosine 6mg rapid IV push x1, followed by a 20 ml flush.
   e. Synchronized cardioversion @ 100 joules
   f. If no response, synchronized cardioversion @ 200 joules

2. Unstable Narrow Complex Irregular Tachycardia
   a. Oxygen, IV/IO access, fluid bolus as indicated for hypotension.
   b. If at any point, patient becomes unconscious and/or pulseless, treat as V-fib.
   c. Consider Versed 0.05-0.1 mg/kg IV
   d. Consider Adenosine 6mg rapid IV push x1, followed by a 20 ml flush.
   e. Synchronized cardioversion @ 100 joules
   f. If no response, synchronized cardioversion @ 200 joules

3. Stable Narrow Complex Tachycardia - Regular Rhythm
   a. Attempt vagal maneuver (i.e. cough or bear down)
   b. Give Adenosine 6 mg, rapid IVP, followed by a 20 ml flush.
      i. if no conversion, may give Adenosine 12 mg, rapid IVP, followed by 20 ml flush, (up to 2 doses).
   c. If rhythm converts, probable reentry SVT – Continue supportive care
   d. If rhythm does not convert, probable A Flutter, atrial or junctional tachycardia.
      i. Contact Medical Control for orders.
      ii. Treatment may include Diltiazem or Labetalol.

4. Stable Narrow Complex Tachycardia - Irregular Rhythm
   a. Probable A Fib, possible A flutter, or multifocal atrial tachycardia.
      i. Contact Medical Control for orders.
      ii. Treatment may include Diltiazem or Labetalol.

Dosing orders may include:

Diltiazem 0.25 mg/kg IV over 2 minutes, followed by 0.35 mg/kg IV in 15 minutes if needed. May start IV drip at 5-15 mg/hour.

Labetalol 10-20 mg IV every 10 minutes as needed. Use Labetalol in caution in patients with pulmonary disease or CHF.

Note: CCT crews do not routinely carry Diltiazem or Labetalol. When possible, initiate Diltiazem at the sending facility.

Wide Complex Tachycardias

Purpose/Goal: To identify treatment parameters for those patients presenting with Wide Complex Tachycardia (QRS >0.12 seconds).

Initiate routine cardiac care and monitor all patients carefully. Patients are rarely unstable with heart rate less than 150 bpm.

1. Unstable Wide Complex Tachycardia- Regular Rhythm
   a. Oxygen, IV/IO access
   b. Consider Versed 0.05-0.1 mg/kg
   c. Synchronized cardioversion @ 100 joules
   d. If no response, synchronized cardioversion @ 200 joules
   e. If still no response synchronized cardioversion @ 360 joules
   f. Consider Amiodarone 150mg IV over 10 minutes, repeat as needed to a maximum of 2.2 grams in 24 hours.
   g. May also give Lidocaine 1.5mg/kg and repeat one time to a max of 3mg/kg.

2. Stable Wide Complex Tachycardia – Regular Rhythm
   a. If Ventricular tachycardia or uncertain rhythm give:
      i. Amiodarone 150 mg IV/IO over 10 minutes, repeat as needed to a maximum dose of 2.2 grams in 24 hours.
      ii. Prepare for elective synchronized cardioversion.
   b. Wide complex monomorphic regular tachycardia may represent SVT with aberrant conduction in this setting only:
      i. May give Adenosine 6 mg, rapid IVP, followed by a 20 ml flush.
      ii. If no conversion, may give Adenosine 12 mg, rapid IVP, followed by a 20 ml flush (up to 2 doses)

3. Stable Wide Complex Tachycardia – Irregular Rhythm
   a. If Atrial Fibrillation – Contact Medical Control for further orders, which may include rate control with:
      i. Diltiazem 0.25 mg/kg IV over 2 minutes, followed by 0.35 mg/kg IV in 15 minutes if needed. May start IV drip at 5 – 15 mg/hour.

      --OR--

      ii. Labetalol 10-20 mg IV every 10 minutes as needed. Use with caution in patients with pulmonary disease or CHF.
   b. If pre-excited Atrial Fibrillation (i.e. Wolff Parkinson White Syndrome)
      i. Contact Medical Control for further orders.
      ii. Consider antiarrhythmics – Amiodarone 150 mg IV over 10 minutes.
      iii. Avoid AV nodal blocking agents – Adenosine, Diltiazem
      iv. Avoid Lidocaine

   c. If recurrent polymorphic Ventricular tachycardia
      i. Contact Medical Control for further orders
   d. If Torsades De Pointes
      i. Give Magnesium 2 grams IV in 10 ml NS over 2 minutes.

ii. Consider Synchronized Cardioversion starting at 200 joules

CCT crews do not routinely carry Diltiazem, Labetolol, or Procainamide; when possible, initiate these medications at the sending facility.

Ventricular Fibrillation

Purpose/Goal: To identify treatment parameters for patients with ventricular fibrillation.

1. Patients found in VF on arrival at the transferring facility:
   a. Assist with the resuscitation efforts as needed.
   b. If ROSC, transport as appropriate
2. Patients that develop VF during the interfaculty transport will be treated in accordance with the McLean County Area EMS "Cardiopulmonary Arrest – VF/VT" protocol".
3. With conversion to a normal rhythm, initiate IV infusion of antiarrhythmic agent that aided resolution:
   a. Magnesium 10 gm/250ml at 25 ml/hour (1gram/hour rate)
   b. Amiodarone 900mg/500ml – Infuse at 1mg/min over 6 hours followed by maintenance rate of 0.5 mg/min

Pain Control

Purpose/Goal: To identify medications that may be used for pain control in adults.

CCT:

1. Ongoing patient assessment parameters including cardiac monitoring, pulse oximetry, vital signs, $ETCO_2$
2. Placement or maintenance of two IV lines when indicated.
3. Pain Control Medications:
    a. Morphine – 2-5 mg IV increments, if the systolic blood pressure > 90 mmHg, to a maximum total dose of 10 mg. (as requested by transferring physician)

    OR

    b. Fentanyl - 1-2 mcg/kg IV, given over 2 minutes. Titrate every 15 – 30 min, to a maximum total dose of 5 mcg/kg.

    OR

    c. Dilaudid 0.5-1 mg IV given over 1-2 minutes. May be repeated for a maximum dose of 2 mg. May only use Dilaudid on patients 14 years and older.

    OR

    d. Ketamine 0.3mg/kg IV/IO infusion in a 100mL bag over 15 minutes (as requested by transferring physician)

        i. Remember hypotensive patients may become more unstable when sedation and pain medication are given.
        ii. Many of the sedation and pain medications are synergistic. *USE CAUTION* when *USING MULTIPLE* medications in order *TO PREVENT EXCESSIVE SEDATION, APNEA, HYPOTENSION, ETC.*

4. Documentation:
    a. Document the indications for initial and continued analgesia of any patient being transferred.
    b. Document the continued close supervision by noting vital signs, cardiac monitor, pulse oximetry, mental status, and comfort status.
    c. Document any patient refusal of pain medication.

Anaphylaxis/Allergic Reaction

Purpose/Goal: To define parameters of care for the patient with an acute allergic reaction or anaphylaxis.

CCT:

1. Secure and maintain airway (ABC's). Apply high flow oxygen. Apply cardiac monitor.
   a. Be aware that upper airway edema can make intubation difficult and patient may require a surgical airway
2. Assess the severity of the reaction
   a. **Mild/Moderate** symptoms include erythematous or urticarial rash, itching, red watery eyes, runny nose, chest tightness, and shortness of breath, wheezing, abdominal cramping, vomiting
   b. **Severe Symptoms or Anaphylaxis** include the above as well as facial, throat swelling, laryngeal edema, hypotension, respiratory distress or failure, cardiovascular compromise
3. **For a Mild to Moderate reaction**
   a. Benadryl 25 to 50 mg IV/IM max dose 100mg
   b. Steroid
      i. Solumedrol 125mg IV/IM/IO or
      ii. Decadron 10mg IV/IM/IO
   c. H2 Blocker
      i. Ranitidine (Zantac) 50 mg IV/IM max 50mg
      ii. Famotidine (Pepcid) 20 mg IV/IO max dose 40mg
   d. Albuterol Nebulized 5.0mg. May repeat every 10 minutes X 3 doses
   e. Epinephrine 1:1000 0.3 to 0.5 mg IM x1 may repeat
4. **For a Severe/Anaphylactic reaction**
   a. Administer Epinephrine 1:1000 0.3mg to 0.5mg IM x1. May repeat every 3-5 minutes
   b. Establish IV/IO access. Administer fluid bolus. May be repeated as needed for persistent hypotension
   c. Benadryl 50 mg IV/IM/IO max dose 100mg
   d. Steroid
      i. Solumedrol 125mg IV/IM/IO or
      ii. Decadron 10mg IV/IM/IO
   e. H2 Blocker
      i. Ranitidine (Zantac) 50 mg IV/IM max 50mg
      ii. Famotidine (Pepcid) 20 mg IV/IO max dose 40mg
   f. Albuterol Nebulized 5.0mg. May repeat every 10 minutes X 3 doses
   g. For patient with refractory shock with hypotension despite IM epinephrine and fluid boluses consider Epinephrine IV may be given as follows:
      i. Dwindle Epi- 1-3ml IV q 2 to 5 minutes prn
         1. To make dwindle epi mix 1ml of 1:10,000 Epinephrine in 9ml of NS for a 10mcg/ml solution
      ii. Epinephrine 1:10,000 0.01 mg/kg (0.1 ml/kg) slow IV q 2 to 5 minutes
      iii. Epinephrine drip at 0.05 to 0.5 mcg/kg/min (See Appendix B)
5. If possible, remove offending agent (i.e. bee sting, chemicals).

6. For patients taking beta blockers not responding to therapy consider glucagon 1mg IV may repeat

CCT crews do not routinely carry Decadron or H2 Blockers; when possible, initiate these medications at the sending facility.

Aortic Injuries

Aortic Injuries

Purpose/Goal: To identify treatment parameters for those adult patients presenting with aortic aneurysms or dissections.

1. Aortic Dissection or Aneurysm
   a. Secure and maintain airway as indicated
   b. Administer oxygen via mask (12-15 liters/minute)
   c. Establish IV access. At least 2 large bore IV catheters with blood tubing
   d. Identify and address coagulopathy when feasible
   e. When appropriate obtain cross matched or O negative blood and blood products for transport
   f. Assess bilateral blood pressures
   g. Goals of treatment
      i. Control or support blood pressure while maintaining end organ perfusion
      ii. Alleviate pain
      iii. Rapid transport to definitive care
   h. Provide Pain Control—See Protocol
   i. If Hypertensive SBP >120
      i. Initiate antihypertensive agent
      ii. ß-blocker or calcium channel blockers IV are first line agents
         1. Goal: systolic pressure <110 mm Hg or MAP 70 to 80
         2. Labetalol 10 to 20mg slow IV push followed by
            a. Labetalol Drip at 0.5 to 2.0 mg/min
               --or--
            b. Intermittent Labetalol IV push 10 to 80mg q 10 minutes prn
            c. Max dose 300mg
         3. Diltiazem 10 to 20mg slow IV push followed by
            a. Cardizem drip at 5 to 20 mg/hour
         4. Esmolol load 500 mcg/kg IV over 1 minute followed by
            a. Esmolol drip at 50 to 200 mcg/kg/min
            b. May be preferred agent for patients with COPD, Asthma
      iii. Second Line Agent
         1. To be utilized if inadequate BP control with first line agents
            a. Nitroprusside
               i. Mix 50 mg in 250 mL D5W = 200 µg/mL solution
               ii. IV infusion 0.3-0.5 µg/kg/min titrated to maximum 10 µg/kg/min
               iii. NEVER to be used in aortic dissection without concomitant beta blocker or calcium channel blocker due to reflex tachycardia
   j. If Hypotensive SBP <90
      i. Initiate 500cc IV Fluid Bolus may repeat

ii. Persistent hypotension should prompt concern for exsanguinating hemorrhage from ruptured aneurysm or dissection massive transfusion protocol should be initiated when possible.
iii. Support the blood pressure with fluids, blood or blood products to maintain the systolic blood pressure >90 mmHg or MAP of 70 mmHg
iv. Vasopressors for persistent hypotension not responding to blood or fluids with goal MAP: 70 mmHg
v. Norepinephrine
    1. Mix 8 mg in 250 mL D5W = 32 mcg/mL
    2. IV infusion 8-12 mcg/min and adjust to maintain BP

Toxic Exposures/Poisonings

Purpose/Goal: To establish treatment parameters for the care of patients who have poisoning and/or drug overdose.

Overview: Poisoning may occur by ingesting, injecting, inhaling, or absorbing a harmful substance or a substance in harmful quantities. Due to the magnitude and multiplicity of agents that are toxic or could be used as toxins, this protocol focuses on a general approach to the patient who has taken an overdose or contacted a toxic agent.

1. Ensure the patient is adequately decontaminated prior to contact.
2. Routine cardiac care.
3. Maintain airway, consider intubation if absent gag reflex or depressed LOC.
4. 100% O2 by NRBM.
5. Monitor for arrhythmias.
6. IV of NS or LR at TKO rate unless hemodynamic status indicates otherwise.
7. If unconscious administer:
    a. D50 50ml IVP or D10 250 ml infusion until improvement in LOC (If blood glucose < 60 mg/dL)
        i. Note to titrate to effect.
    b. Narcan 2 mg IVP
8. ~~Activated Charcoal 1Gm/Kg PO/NG/OG within 30-60 minutes post ingestion to prevent absorption (not for use in caustic, corrosives, or heavy metal ingestions). Consider definitive airway in cases of decreased LOC or possible airway compromise.~~

NOTE: Overdose or ingestion of agents that might produce hallucinations could pose a need for additional personnel to treat the patient.

Special Considerations

1. Suspected **Narcotic** overdose (i.e. Morphine, Demerol, Heroin, Dilaudid, Methadone, Nubain, Stadol)
    a. Narcan 1-2 mg IVP
    b. Dose may need to be repeated as needed consider drip if multiple doses required
    c. Narcan Drip 0.0025 to 0.16 mg/kg/hr

2. **Organophosphate** exposure (cholinergic symptoms include the acronyms
    a. 'SLUDGE' S=salivation, excessive; L=lacrimation; U=Urination; D=Diarrhea; G=Gastrointestinal distress; E=Emesis
    b. 'DUMBLES' D=Defecation; U=Urination; M=Miosis; B=Bronchorrhea; E=Excitation (muscular); S=Salivation, Seizures
    c. 'MTWtHF' M=Muscle weakness and paralysis; T=Tachycardia; W=Weakness; H=Hypertension; F=Fasiculations
    d. Atropine 0.5-1 mg IVP every 2-5 minutes until reversal of cholinergic symptoms or maximum dose of 100 mg.
    e. 2-PAM if it is available at the outlying hospital. Dose per accepting physician.

3. **Cocaine**

a. Standard medical protocol for chest pain
b. Avoid beta blockers (Lopressor, Labetalol)
c. Maintain normothermia (hyperthermia risk)
d. Monitor BP. Contact Medical Control for hypertension management guidelines
e. Ativan 1to 2 mg IV prn agitation

4. **Tricyclic antidepressants** (Tofranil, Elavil, Pamelor, Sinequan, Norpramin)
   a. Specific management based on signs and symptoms
      i. Rapidly developing altered level of consciousness
      ii. Cardiovascular instability
      iii. Widening QRS complex >0.10 seconds
      iv. Tachycardia
      v. Hypotension
      vi. Ventricular dysrhythmias
      vii. Seizure activity
   b. Ventricular dysrhythmias
      i. If QRS interval is >.10 seconds or a ventricular arrhythmia present treat with Sodium Bicarbonate 1-2 mEq/kg rapid IVP (to alkalinize the plasma. Goal is to maintain pH >7.40). If no response may repeat in five minutes. Should QRS narrow or not follow with IV drip of Sodium Bicarbonate 150 mEq/1 liter D5W infused at 250ml/hr.
   c. CNS Toxicity
      i. Consider intubation for decreased LOC, coma
      ii. Treat seizures (see Seizure protocol). First line treatment Benzo's. Avoid using Phentoin.
   d. Hypotension
      i. Initial management should include 500 ml NS bolus
      ii. Sodium Bicarbonate 1-2 mEq/kg IVP may repeat x 1 dose in 5 minutes.
      iii. Consider pressor agent for hypotension refractory to two fluid boluses. Pressor of choice is Norepinephrine or Neosynephrine titrated to effect.
      iv. For hypotension that is refractory of all above treatments consider 3% Saline 100 ml IV bolus at ten minute intervals.

5. Beta-blocker poisoning
   a. Specific management based on signs and symptoms. Most patients become symptomatic within two hours and nearly all within 6 hours of ingestions. Exception for sustained released forms such as Sotalol.
   b. Bradycardia and Hypotension are most common effects. Severe overdoses can result in profound myocardial depression and cardiogenic shock. Other potential effects of severe toxicity include mental status changes, seizure, hypoglycemia, and bronchospasm.
      i. Studies – EKG, blood glucose, serum electrolytes including calcium.
   c. Management
      i. Secure airway and ACLS support if needed.
      ii. Atropine should be first line treatment for bradycardia and pretreatment for RSI. 0.5 -1mg IV q 3-5 minutes up to total of 0.3-0.4 mg/kg
      iii. Treat symptomatic hypoglycemia with D50.
      iv. Treat Seizures with Benzo's

v. If symptoms persist despite above treatments as exhibited by profound hypotension and/or severe bradycardia or depressed mental status. Continue as follows.
    1. IV glucagon 5 mg IV over 1 minute. If no increase in pulse or BP after 10-15 minutes administer second bolus. If no increase on BP or pulse after 10 minutes it is unlikely an infusion will help. If there is an improvement start infusion at 2 to 5 mg/hr goal being to maintain MAP of 60mmhg.
    2. Vomiting is common with Glucagon administration consider Zofran.
    3. If still unstable consider CaCl 1 gram slow IV push for total of 3 grams a central line should be used/OR Ca Gluconate 30ml of 10% soln. May repeat to max of 3 grams. Cacl preferred soln.
    4. Vasopressors may be added if the combination of atropine, IV Fluids, glucagon, and IV calcium are unsuccessful or temporizing measure until high dose insulin therapy can be started. Epinephrine infusion of 1mcg/min can be started and titrated to maintain MAP of 60. Titrate down as possible to maintain MAP of 60
    5. HDI (High Dose Insulin) should be considered (See Ca channel OD).

6. Calcium Channel Blocker poisoning.
    a. Signs and symptoms may include hypotension. Bradycardia may be present but usually only in verapamil or diltiazem or severe nifedipine OD. Signs of heart failure may be present. Despite hypotension CCB OD patients usually maintain clear mental status. Hyperglycemia may be present and may help differentiate between beta blocker OD whose blood glucose is usually not elevated.
    b. Treatment. IV fluids for hypotension and Atropine for bradycardia are the first line treatments but both may be insufficient.
        i. For severe OD all of following may be utilized simultaneously.
            1. Stabilize airway as needed
            2. Additional IV fluid boluses
            3. IV calcium Cacl 10 -20 ml of 10% soln over 10 minutes through a central line up to four doses 20 minutes apart or Ca Gluc 30-60 ml of 10% soln up to 4 doses 20 minutes apart.
            4. IV glucagon 5 mg IV bolus may be repeated twice at 10 minute intervals. An infusion may be started if/or when IV bolus provokes a response.
            5. IV pressors. Levophed is pressor of choice rapidly titrated to MAP of 65. May be necessary to add Epinephrine and Dopamine. In CCB od's not uncommon for higher than normal doses of pressors. Possible Levo 100mcg/min, Epi 150 mcg/min, Dop 100mcg/kg/min.

Nausea/Vomiting

Purpose/Goal: To identify treatment parameters for those patients with nausea and vomiting.

1. Treatment of nausea and vomiting will be in accordance with the McLean County Area EMS System Standing ALS protocol.
2. May administer Promethazine per transferring facility orders (Static Drip Only).

Sepsis

Purpose/Goal: To identify treatment parameters for the adult patient who presents with sepsis.

CCT:

Indications for use of Sepsis Protocol

Miami Sepsis Score	
1	Body temp Greater ≥ 38^{c} (100.4^{f}) or ≤ 35.5^{c} (96.0^{f})
1	Respiratory rate ≥ 22/minute
2	Shock index ≥ 0.7 (Heart rate/Systolic BP)
	Composite Score

A. Confirmed or suspected source of infection.
B. WBC count greater than 12,000, OR WBC count less than 4,000, OR greater than 10% bands.
C. Systolic BP less than 90 mmHg after initial 20-30 ml/kg IV fluid bolus.
D. Serum lactate greater than 4 mmol/L
E. Altered mental status

1. Routine cardiac care.
2. Review lab values or perform bedside blood glucose testing. Treat hypoglycemia
3. Administer oxygen and secure airway as necessary to keep oxygen saturations ≥ 93%.
   a. 4 L/min by nasal cannula
   b. 15 L/min by NRBM for marked dyspnea if patient will tolerate mask.
   c. Intubate as necessary.
      1.) If O2 saturations < 93%, ventilation is difficult, or ARDS is suspected consider increasing the PEEP decreasing the tidal volume and increasing the rate. May cause worsening hypotension
4. Administer 500 – 2000 ml IV 0.9% NS bolus for a MAP < 65 mmHg. Minimum bolus: 20-40 ml/Kg.
5. If MAP remains < 65 mmHg despite fluids,
   a. Start Levophed, 8 mg/250ml of D5W. Begin infusion at 2-4 mcg/min. Titrate to desired effect, up to a maximum dose of 30 mcg/min. ***And***/***Or***
   b. Start Dopamine 400 mg/250ml at 5 mcg/kg/min and titrate to desired effect, up to a maximum dose of 20 mcg/kg/min. ***And***/***Or***
   c. Epi Drip 0.1 – 1 mcg/kg/min
6. Confirm antibiotic (Zosyn, meropenem, cefepine, levofloxacin) administration and request order if not already completed by sending facility.

Stroke/TIA

Purpose/Goal: To define treatment parameters for those patients being transferred for stroke symptoms.

CCT:

1. Secure and maintain an airway if necessary.
2. Monitor pulse oximetry. If SaO2 < 94%, administer supplemental O2 via nasal cannula. If O2 saturation if >94%, no supplemental O2 is necessary.
3. Establish IV access if not already present utilizing a LR or NS solution. Infuse at less than 80 ml/hr.
4. Initiate routine cardiac care.
5. Blood Pressure Management:
   a. If known ischemic stroke, treat if SBP >220 or DBP >120.
   b. If known hemorrhagic stroke treat if SBP > 140mmHg.
   c. If etiology unknown **OR** tPA has been given, treat if SBP >180 or DBP >110.
6. Options for control of blood pressure include:
   a. Labetolol 10-20 mg IVP as needed. Maximum cumulative dose is 300mg. Use with caution if HR<60. (Physician order only)
   b. Nicardipine (Cardene) drip 5mg/hour (50 ml/hour of 0.1mg/ml solution). Initially, increase by 2.5 mg/hour (25 ml/hour) every 5-15 minutes to desired blood pressure reduction or maximum of 15 mg/hour (150 ml/hour). (See Appendix E) (Physician order only)
7. In the patient with tPA infusing:
   a. Monitor BP at least every 15 minutes.
   b. Institute BP control as indicated above. For continued SBP>180 or DBP >110, notify accepting neurologist.
   c. Do not give heparin, ASA, Coumadin, or Lovenox with tPA.
   d. If neurologic status deteriorates or if any evidence of uncontrolled bleeding occurs, stop tPA and notify accepting neurologist.
   e. tPA dosage 0.9 mg/kg to a maximum 90 mg. Administer 10% IV bolus over 1 minute and infuse the remaining over 60 minutes.

Spinal Cord Injuries

Purpose/Goal: To define parameters of treatment for those patients with spinal cord injuries.

CCT:

1. Routine Cardiac Care
2. Initiate trauma care including maintenance of patent airway, adequate respiratory rate and circulation. (Refer to RSI protocol)
3. Assure proper spinal column immobilization.
4. Perform brief but thorough neurologic assessment to determine any deficits and/or paralysis.
5. Determine approximate time of injury.
6. Maintain a mean arterial pressure (MAP) of 85 or greater. Consider administering Neosynephrine bolus, Levophed, or Dopamine if the patient is unresponsive to fluid boluses.

Burns

Purpose/Goal: To identify parameters of care for the adult patient with burns.

CCT:

1. Assess airway. Consider elective intubation if patient was in a closed space burn or has significant airway burn injury. Secure and maintain airway. Administer 100% O2.
    a. Indications of inhalation injury include
        i. Facial burns
        ii. Singed eyebrows and nasal hair
        iii. Carbonaceous sputum
        iv. Acute inflammation to oropharynx
        v. History of impaired mentation and/or confinement in an enclosed burning environment
        vi. History of explosion
2. Obtain vital signs, Initiate cervical and spinal immobilization as indicated
3. Routine Cardiac Care
4. Start 2 large bore IV's with lactated ringers or 0.9 normal saline and initiate a one liter bolus, a second bolus may be given as indicated by patient condition.
5. Assess percent of body surface area burned by using Modified Lund Browder Chart
6. Adjust rate according to Parkland Formula
    a. 2-4ml x percent of burn x kg body weight = fluid required in first 24-hours.
        i. Administer half during the first 8 hours post burn
        ii. Parkland formula is calculated on partial thickness 2nd degree burns or higher—1st degree burns ARE NOT figured into this calculation
7. Remove all clothing, jewelry etc that may become restrictive with edema.
8. Wrap burned areas in sterile dry gauze.
9. Obtain history.
10. Medicate for pain as indicated.
11. Consider inserting an oral or nasal gastric tube for nausea, vomiting, abdominal distension or TBSA burns > 25% (if interfacility transfer).
12. Chemical burn, if not already decontaminated:
    a. Irrigate prior to leaving scene.
    b. If dry powder, brush powder away and then irrigate.
    c. Decontaminate as indicated by substance
13. If electrical burn:
    a. Routine cardiac care
    b. IV fluids at maintenance rate (if no contraindications).

Hypovolemic/Hemorrhagic Shock

Purpose/Goal: To define treatment parameters for the adult trauma patient with hypovolemic or hemorrhagic shock during an inter-facility transfer.

CCT:

1. Perform primary assessment and stabilization of airway as indicated. Maintain spinal immobilization and control bleeding.
2. Confirm or establish adequate IV access. Either 2 large bore IVs, central line, or IO. Give initial IV fluid bolus of 500ml NS or LR
3. Routine cardiac care.
4. Control compressible hemorrhage
    a. Utilize CAT tourniquets for uncontrolled extremity hemorrhage
    b. Apply T-POD to any known or suspected pelvic fracture
5. Complete secondary assessment.
6. Address and reverse known coagulopathy (ie Coumadin) when possible
    a. Vitamin K 10mg IV
    b. FFP 2-4 units
    c. Other medications or blood products with physician order
7. Fluid Resuscitation
    a. Hypotensive (<90mmHg systolic, heart rate > 120bpm, tachypnea) without suspicion of head injury
        i. Initiate blood transfusion if immediately available (per protocol)
        ii. If blood not available repeat 500ml fluid bolus (NS/LR) with a goal of maintaining systolic blood pressure >80mmHg
    b. Hypotensive (<90mmHg systolic, heart rate >120bpm, tachypnea) with suspicion of head injury
        i. Initiate blood transfusion if immediately available
        ii. If blood not available repeat 500ml fluid bolus (NS/LR) with a goal of maintaining systolic blood pressure > 100mmHg
8. TXA administration per 911 protocol
9. Consider initiation of massive transfusion protocol if available and/or call ahead for receiving facility to do the same
10. Frequent reassessment of vital signs as indicated.
11. Place foley catheter, if not yet done and not contraindicated (contraindications include evidence of pelvic fracture with blood at urethral meatus).
12. Place NGT or OGT if no contraindications. (Contraindications to NGT insertion include obvious facial fractures, suspected basilar skull fracture).
13. Splint obvious fractures.
14. Dress open wounds.
15. Rapid transport.

Blood Administration

Purpose/Goal: To identify treatment parameters for the administration of blood products

In most cases, the administration of blood will be in progress on arrival of CCT crew. In situations where time is critical, blood products may be sent with the crew in an appropriate insulated container for administration during transport.

1. Identify and document indications for transfusion, including significant symptomatic anemia or hemorrhagic shock.
2. Obtain or verify informed consent for administration of blood products when possible
3. Crosscheck patient name and identification number on patient ID band with same data on the transfusion tag.
4. Obtain approximate release time from blood bank to ensure release of products within the last four hours
5. CCP or PHRN shall verify the ABO group/Rh type and unit numbers from the transfusion tag while a second crewmember or RN at sending facility verifies the same data on the blood product.
6. Blood unit identification number shall be documented on the Patient Care Report with time of blood administration and cessation.
7. In the event that patient identification and/or blood product identification numbers do not match, or cannot be verified due to inadequate banding of the patient or blood product, the product will not be accepted or administered by CCT crew personnel.
8. Infuse blood with 0.9NS and administer through a 20 gauge or larger IV catheter
9. Blood products should be administered as indicated by patient condition or physician order. No single unit should be administered for > 2 hours.
10. Document VS at least every 10 min during administration including temperature
11. In the event of a transfusion reaction (ie fever, chills, anaphylaxis, back/chest pain, bronchospasm, itching)
    a. Discontinue blood administration for severe reaction
    b. For mild reaction (flushing, pruritis, mild rash, hives, etc) administer Benadryl 25-50mg IV for adults (pediatric dose 1mg/kg, not to exceed 50mg/dose) and continue close monitoring
    c. See Anaphylaxis protocol or management.
    d. Blood and blood tubing should be turned over to the accepting medical staff.
    e. Identify and document signs and symptoms of allergic reaction and interventions.
12. Consider initiation of massive transfusion protocol when feasible, indications include
    a. > 4-6 units for an adult
    b. > 40ml/kg for peds
    c. Maintenance of vital signs dependent on blood administration
13. Transported blood products not administered to the patient in transport will be turned over to the accepting medical staff.

Critical Care Plan

Blood Product Infusion

Transferring Facility_____ Receiving Facility_____

Patient Name_____ Age____ Patient ID_____

Blood Unit Number_____

Confirmed by:_____ _____

Date_____ Start Time_____ ___FFP ___PRBC ___Platelets

	Time	B/P	Pulse	Resps	Temp	Initials
Starting Vitals						
15 minutes						
30 minutes						
1 Hour						
2 Hours						
3 Hours						
4 Hours						
Ending Vitals						

Ending Time_____ Crew Signature_____

Drug Assisted Intubation

1. Follow DAI Checklist
2. Induction Agent:
    a. Ketamine 2mg/kg
    b. Midazolam 0.05mg/kg
    c. Fentanyl 1-3mcg/kg (Fentanyl used in conjunction with Ketamine or Midazolam)
3. Rocuronium 1mg/kg or Vecuronium 0.1 mg/kg for paralytic
4. Perform Intubation
5. For continued sedation, choose an appropriate medication for continued sedation based on patient status. Contact receiving or transferring physician for clarifications.
    a. Midazolam 0.05mg/kg (3-5mg in adults) every 15-30 minutes PRN
    b. Fentanyl 1-3mcg/kg IV over 2 minutes
    c. Ketamine 0.5-1.5mg/kg every 5-10 minutes
    d. Midazolam Infusion 1-10mg/hr
    e. Fentanyl infusion 25-100mcg/hr
    f. Precedex infusion 0.2mcg-0.7mcg/kg/hr
    g. Propofol infusion at: Maintenance rates of 10-50mcg/kg/min. Titrate in increments of 5-10mcg/kg/min. Typical highest dose is 75mcg/kg/min. If sedation is inadequate, a bolus dose maybe administered of 0.5-1mg/kg and the infusion rate adjusted accordingly.

Note*

- If patient needs re-sedation administer:
  Rocuronium 1mg/kg IVP or Vecuronium 0.1mg/kg IVP

Drug Assisted Intubation Check Sheet

Critical Care DAI CHECK LIST

Preparation Time Started: _____

◯ Standard Nasal Cannula ◯ NPA ◯ Suction ◯ ET Tube ◯ Video Laryngoscope ◯ BIAD ◯ Bougie
◯ BVM w/ PEEP valve ◯ Capnography ◯ Tape ◯ Roles Assigned ◯ Tube Holder ◯ Syringe for ETT

◯ Induction Medication: _____ ◯ Paralytic: _____
Initial Sp02 (Prior to Intervention): _____

Sedation/Oxygenation

◯ Induction Dose: _____ Time Given: _____
◯ Insert NPA and apply nasal cannula at max flow rate
◯ Pre-Oxygenate patient with BVM at normal rate
◯ Apply inline capnography w/ BVM ◯ Begin PEEP at 5cmH20 and increase as needed (max PEEP of 10)
◯ Ventilate for 3 minutes ◯ If resources allow, perform 2 person BVM ventilations
◯ Position patient at a 30-degree angle (the ear to sternal notch position
◯ Prepare intubation equipment (ET tube, video laryn, BIAD, suction, Bougie)
Pre-intubation Sp02: _____ Pre-intubation Capnography: _____

Intubation

◯ Administer paralytic, dose: _____ Time Given: _____
◯ Ventilate for
◯ Use video laryngoscope, 1 attempt for a max attempt time at 20 seconds
◯ If unable to intubate within 20 seconds, abort attempt and insert a BIAD

Post Intubation

◯ Confirm placement of ET Tube or BIAD
◯ Ventilate at a rate of 10/min
◯ Secure placement of ET tube or BIAD
◯ Post-intubation Sp02: _____ ◯ Post-intubation Capnography: _____
◯ Administer follow up sedative based on initial sedative used to keep patient sedated

Data Time Completed: _____ Lead Provider: _____

Notes

*Use of video laryngoscope is required
*Attempt is defined as the tube advancing towards the trachea (note for pre-loaded tubes, this means the tube pass the end of the blade or if using a non-preloaded blade, it is when the tube passes the teeth)
*Ensure patient remains sedated throughout transport

*Form must be completed on ALL DAI's and attached to run report Version 1.1 – 2/3/2021 (all other versions are obsolete)

	Induction/Sedation Medications		Paralytic Medications	
	Medication	**Dosage**	**Medication**	**Dosage**
Induction	Ketamine – induction (IVP)	2mg/kg	Rocuronium	1mg/kg
Induction	Midazolam – induction (IVP)	0.05mg/kg (3-5mg) every 15-30 minutes	Vecuronium	0.1mg/kg
Induction	Fentanyl – *See note (IVP)	1-3mcg/kg IV over 2 minutes	*Fentanyl must be given with another induction agent. It cannot be given as a solo medication in this procedure	
Continued Sedation	Ketamine – cont. sed (IVP)	0.5 – 1.5mg/kg every 5-10 minutes		
Continued Sedation	Midazolam – cont. sed (Drip)	1-10mg/hr		
Continued Sedation	Fentanyl – cont. sed (Drip)	25-100mcg/hr		
Continued Sedation	Precedex – cont. sed (Drip)	0.2mcg – 0.7 mcg/kg/hr		
Continued Sedation	Propofol	Maint. 10-50mcg/kg/min. Titrate in increments of 5-10mcg/kg/min. Highest dose of 75mcg/kg/min.		

General Airway Information

The LEMON approach to assess the airway is a series of physical evaluations to determine whether airway difficulty is anticipated.

L: *Look externally*. Does the patient have abnormal facies, unusual anatomy, or significant obesity?

E: *Evaluate (3-3-2 rule)*. The relationship between the size of the mandible, the distance between the mentum and the hyoid bone, and the extent of mouth opening.

3 = A normal patient can open his mouth enough to permit three of his own fingers to be placed between the incisors.

3 = A normal patient is able to place three of his fingers along the floor of the mandible between the mentum and the neck/mandible junction (near the hyoid bone).

2 = A normal patient is able to place two fingers in the superior laryngeal notch (i.e. the space between the superior notch of the thyroid cartilage and the neck/mandible junction, near the hyoid bone)

M: *Mallampati*. The Mallampati classification is a simple scoring system to help predict difficult intubation. The Mallampati class, ranging from I to IV, relates the amount of mouth opening to the size of the tongue, and provides an estimate of space for oral intubation by direct laryngoscopy. In general, Mallampati class I or II predicts easy laryngoscopy, class III predicts difficulty, and class IV predicts extreme difficulty.

O: *Obstruction*. The presence of upper airway obstruction interferes with both laryngoscopy and intubation.

N: *Neck Mobility*. Decreased cervical spine mobility, specifically limitation of extension of the head on the neck, compromises the laryngoscopic view.

The MOANS mnemonic is used to predict difficulty with BVM in patients.

M: *Mask Seal*. Requires reasonably normal anatomy, facial hair, lack of interfering substances, such as excessive vomitus or bleeding, and the ability to apply pressure to the face with the mask.

O: *Obesity*. Upper airway tissue and the combination of chest wall height and resistance from abdominal contents all impede airflow. Placing the bed in reverse Trendelenberg may reduce impedance to airflow from abdominal weight.

A: *Age*. 55 years and older is a marker of difficult BVM. Loss of elasticity of tissues and increased incidence of obstructive pulmonary disease make ventilation more difficult.

N: *No teeth*. Creates difficulty with BVM. Teeth provide a framework against which the mask sits and supports the cheeks. If a patient has dentures, they should be left in place during BVM and removed for laryngoscopy.

S: *Stiffness*. With respect to BVM, refers to conditions that make the lungs still or resistant to ventilation. Includes asthma, COPD, pulmonary edema, widespread infiltrates, and other conditions that decrease pulmonary compliance.

Additional Defined Terms:

Bougie: A long cylindrical instrument that is flexible and yielding used for cannulating the trachea in order to thread an endotracheal tube into the tracheal opening.

BURP: A technique used to displace the cricothyroid cartilage in order to bring the vocal cords into view of the person performing laryngoscopy. The mnemonic stands for **B**ackward, **U**pward, **R**ightward, **Pressure.**

BiManual technique: A technique in which one crewmember uses two hands to hold the laryngoscope blade and handle in place and a second crewmember passes the endotracheal tube into the trachea.

Transport Ventilator Use

Purpose/Goal: To establish guidelines for appropriate uses of the Transport Ventilator.

Policy Statements: The Transport Ventilator may be used on patients who are intubated and require mechanical ventilation. The Transport Ventilator may also be used on patients who require non-invasive positive pressure face-mask ventilation during transport.

CCT:

1. The Transport Ventilator may be utilized for adult and pediatric patients.
2. Ventilator set-up and device check must be done prior to each patient use:
    a. Attach ventilator circuit, connect ventilator to the oxygen source, and attach the test lung to the circuit.
        i. 22 mm SPU circuit for >20 kg patients
        ii. 15 mm SPU circuit for 5-20 kg patients
    b. Power on the device and turn the rotary knob to get into the menu screen
    c. Choose "Device Check" from the menu and confirm.
    d. Follow the instructions on the screen to run the complete device check. After the device check is complete, the display will show "Device check ventilation, monitoring and alarm detection is running"
    e. Once the test is completed, select "ventilation" in the main menu and confirm through rotary knob to start ventilation.
    f. Select the mode: Intubated or NPPV
    g. Size
        i. Adult
        ii. Peds
        iii. Infant
    h. Select Intubated
    i. Enter the desired ventilator settings prior to placing the patient on the ventilator.
3. As a general rule; ventilator settings can be based on the patient's ventilator settings at the transferring hospital and adjusted as necessary.
4. In the event that the patient is a newly intubated patient, the following guidelines for ventilator settings will be used.
    a. The "PRVC" or "Assist Control" mode will be used for those patients who are sedated and paralyzed.
    b. The PRVC or SIMV mode can be used for those patients with spontaneous respirations.
    c. Tidal volume of 6-8 ml/kg ideal body weight, 5-7 ml/kg for patients with ARDS
    d. Ventilation frequency (rate)
    e. PEEP of 5 (or as indicated)
    f. Sensitivity or Trigger defaults to 3 (smaller the value = higher the sensitivity)
    g. I:E Ratio has a default setting of 1:1.5, it may need increased to as high as 1:4 for asthma/COPD patients that are trapping air
    h. Peak pressure alarms are usually set at 40-50.

5. For newly intubated patients that require pressure controlled ventilation, those with non-compliant lungs resulting in high airway pressures and poor oxygenation while on volume controlled ventilation or pediatric patients with a tidal volume of <50ml.
    a. The PCV (Pressure Controlled Ventilation) mode should be chosen.
    b. The Peek inspiratory value should be set at 18-20 to start with and adjusted according to the patients expired tidal volume (Vte) with a goal of 5-8ml/kg returned.
        i. The less compliant the lungs the higher the P insp value will have to be
        ii. The Transport Ventilator works on absolute values meaning they include the PEEP value in the P insp therefore the P insp may need to be higher than the sending facilities ventilator (likely the value of the PEEP)
    c. The frequency (rate) still needs to be set, keep normal rates in mind according to the patients age
    d. Peep of 5- if this value is increased the P insp needs to be increased the same amount
    e. Trigger setting of 3 (smaller the value = higher the sensitivity)
    f. I:E Ratio has a default setting of 1:1.5, it may need increased to as high as 1:4 for asthma/COPD patients that are trapping air
    g. Peak pressure alarms are usually set at 40-50.
    h. Pressure support can be set and will be provided with spontaneous patient breaths
6. Vent settings and guidelines for use on pediatric patients should come from or be reviewed with the sending MD prior to placing the patient on the ventilator when it is feasible
7. See the “Non-Invasive Face Mask Ventilation” policy for information on Bi-Pap and CPAP settings.
8. Medical crew members should contact Medical Control or the accepting physician for assistance with ventilator settings if needed.

Non-Invasive Positive Pressure Face-Mask Ventilation

Purpose/Goal: To establish guidelines for non-invasive positive pressure face-mask ventilation using the Transport Ventilator.

Policy Statements: The transport ventilator may be used on patients who require non-invasive positive pressure face-mask ventilation during transport.

Non-invasive positive pressure face-mask ventilation is primarily intended to augment patient ventilation by supplying pressurized air through a patient circuit. Patients presenting with acute respiratory insufficiency, acute respiratory failure, and obstructive sleep apnea syndrome will find the best benefit from non-invasive face-mask ventilation. The modes of ventilations are Continuous Positive Airway Pressure (CPAP) and Noninvasive Positive-Pressure Ventilation (NPPV), sometimes referred as BiPAP.

Non-invasive face-mask ventilation requires the patient be closely monitored.

Contraindications for non-invasive face-mask ventilation include:

a. Patients incapable of maintaining life-sustaining ventilation.
b. Recent Esophageal or Facial surgery
c. High Risk for Aspiration
d. Inability to clear secretions or viscous/copious secretions
e. Craniofacial Trauma or Burns
f. Patients with known or susceptible to pneumothorax or pneumomediastinum should be monitored closely when applying positive pressure.
g. Patients with an inability to maintain a patent airway or to adequately clear secretions.
h. Epistaxis causing pulmonary aspiration of blood.
i. Severe respiratory failure when intubation is judged to be immediately necessary.

CCT:

1. Select “on” and confirm.
2. Use only a non-vented mask.
3. If the sending facility has initiated treatment prior to arrival, the face mask may be utilized if it is nonvented or can be made nonvented.
4. If mask cannot be used or treatment is just being started, place the appropriate sized mask on the patient’s face and tighten the headgear so the mask rests on the patient’s face. Do not over-tighten the headgear. Non-invasive face-mask ventilation with the transport ventilator will compensate for leaks, up to 30 lpm.
5. Select the mode:
    a. Size
        i. Adult
        ii. Peds
        iii. Infant
6. Select NPPV
7. For CPAP (Continuous Positive Airway Pressure)
        i. Set IPAP to desired setting

ii. Set EPAP (PEEP) the same as IPAP

8. For NPPV (BiPAP)
   a. Set the IPAP, pressure support level. The transport ventilator works in absolute values, meaning the PEEP is not included in the pressure support value
   b. Set the EPAP, PEEP level.
   c. Typical initial settings are Pressure Support 10, Peep of 5 (commonly referred to as 10/5).
9. Set the FiO2 to be delivered to the patient.
10. Troubleshooting
   a. If difficulty oxygenating the patient, increase the FiO2 or increase the PEEP.
   b. If the tidal volume is low, give more pressure support.
11. Closely monitor the patient for:
   a. effectiveness of ventilations
   b. decreasing level of consciousness
   c. nausea
   d. potential for aspiration
   e. abdominal distention/vomiting
   f. hypoxia despite maximum FiO2
   g. decrease in breath sounds, either unilaterally or bilaterally
   h. increased agitation/anxiety
   i. appearance or an increase in JVD
   j. other evidence of impending or worsening respiratory failure

Routine Medical Care of the Obstetrical Patient

Purpose/Goal: To establish basic expectations for routine medical care provided to expectant mothers and newborn infants during transport of gravid patients without a Labor and Delivery Nurse present.

CCT:

1. Perform initial General Patient Assessment and determine patient's pregnancy status.
2. Routine medical care.
3. If time allows, obtain focused Obstetrical History in addition to primary and secondary survey: Obstetrical History as follows.
    a. Number of pregnancies (Gravida)
    b. Number of live births (Para)
    c. Expected date of confinement-due date or EDC
    d. Determine if membranes are intact or ruptured
    e. Prenatal care
    f. Length of previous labors
    g. Previous complications
    h. Onset, duration, frequency, and severity of contractions if present
    i. High risk considerations:
        i. Drug abuse
        ii. Patient is an adolescent
        iii. History of diabetes
        iv. History of hypertension
        v. Previous breech birth
        vi. Previous C-section
        vii. Multiple gestation
4. Signs and symptoms of imminent delivery:
    a. Contractions less than 2 minutes apart
    b. Experiencing the urge to push
    c. Sensation of perineal pressure
    d. Having involuntary pushing with contractions
    e. Consider multiparity and duration of previous labors
    f. Examine the perineum for crowning or bulging
5. If the transfer is in progress and delivery is felt to be imminent; prepare for emergency delivery (See policy "Imminent Vaginal Deliveries").
6. Never attempt to delay or restrain the delivery unless a prolapsed cord is noted (see policy "Aberrant Delivery Situations: Prolapsed Cord").
7. If delivery is not determined to be imminent, the patient may be transported after a complete primary and secondary assessment including:
    a. Visual inspection of the perineum is performed
    b. Character of amniotic fluid, including presence or absence of meconium staining, is noted
8. Internal vaginal exams <u>will not</u> routinely be performed by CCT crew.
9. If possible, check fetal heart tones.
10. All pregnant patients should be transported in a left lateral recumbent position.
11. Call for Medical Direction at any time as indicated.
12. Rapid transport and continue monitoring.

NOTE: If presenting as a high risk OB transfer, requesting an OB nurse or Obstetrician should be considered

Imminent Vaginal Deliveries

Purpose/Goal: To delineate the medical care provided and steps involved in an uncomplicated spontaneous vaginal delivery.

CCT:

1. Routine medical care
    a. Establish IV
    a. Provide supplemental oxygen for oxygen saturations less than 94%
    b. Fluid bolus as indicated for hypotension (SBP<90)
    c. EKG monitoring
2. Position the mother in lithotomy (delivery) position on her back with hips flexed with wedge (IV bag) under hips.
3. If available, use towels or pillows under the buttocks to elevate the hips.
4. BSI- Gown, mask, gloves.
5. Prepare equipment.
6. Create a clean field for the delivery.
7. Protect the mother's modesty as able.
8. Support the baby's head during the delivery being careful to support the bony parts of the skull and avoid pressure on the fontanel and the face/eyes. Babies usually present face down initially, and then rotate left or right.
9. As the head emerges and rotates do not pull or push the head, simply continue to support the head as it turns.
10. At this point if the amniotic sac has not broken or does not break it should be punctured.
11. At this point a finger should be slid along the child's neck to check for a nuchal cord and if one is identified, reduce it by hooking a finger under the cord and pulling it over the child's head.
12. If the child has a tight nuchal cord that is unable to be reduced, the cord will have to be clamped and cut between the clamps being careful not to injure the child.
13. The anterior shoulder will deliver. To assist with this, guide (DO NOT PULL) the baby's head gently downward and the shoulder will emerge.
14. Gently guide the head upward to allow the posterior shoulder to deliver.
15. After the posterior shoulder delivers, the child's torso and legs will quickly follow, be careful, the child is very slick at this point.
16. Once the delivery is complete, wipe the child's face and suction the mouth and nose if necessary.
17. Dry the baby with sterile towels.
18. Keep a firm but gentle grip on the child and keep the infant level with the perineum while the cord is clamped and cut.
19. The umbilical cord should be clamped with two umbilical clamps or tied securely with umbilical tape about 4 to 6 inches from the child's navel with the clamps or ties placed about 2" apart and then cut between them.
20. After cutting the cord, confirm that the ends are not actively bleeding. If the ends are bleeding, apply a second clamp or tie to stop the bleeding.
21. If the child is not active and crying, gently stimulate by rubbing the back while drying with the sterile towels or flicking the soles of the feet until the newborn has a good strong cry:
    - if child is unresponsive for over 10 seconds, despite efforts to stimulate, proceed to "Newborn Resuscitation" protocol

- if child responds to stimulation, proceed to next step.

22. Wrap the child in warm blankets or apply skin to skin with the mother
23. Apply a hat
24. Record the time of birth
25. Record APGAR scores at 1 minute and 5 minutes .
26. Have your partner resume caring for the child or give the child to the mother to nurse in order to help stimulate uterine contractions as you continue to care for the mother.
27. **Do not let go of the maternal end of the umbilical cord**.
28. The placenta may take up to 20 minutes to deliver, do not apply traction to the umbilical cord. The placenta will deliver spontaneously.
29. If the perineum is torn or excessively bleeding, place a trauma dressing on the perineum and apply direct pressure or have mother bring her legs together to help stop the bleeding.
30. Transfer may be initiated before the placenta delivers
31. Uterine massage may also be used to help stimulate uterine contractions by applying firm but gentle pressure in a circular motion just above the pubic symphysis on the fundus of the uterus which should be easily palpable.
32. Some bleeding after delivery is expected. If bleeding becomes excessive, please refer to “Aberrant Delivery Situations: Post Partum Hemorrhage” protocol.
33. After the placenta delivers, place it in the plastic bag provided in the delivery kit and take it back to the receiving hospital.
34. Update the receiving facility with patient status to allow the receiving unit and physicians to prepare for your arrival

Newborn Resuscitation

Purpose/Goal: Describe the medical care provided and steps involved in the resuscitation of the newborn

CCT:

1. If available, place the newborn on trans-warmer mattress on back or side with head in a neutral position.
2. Dry the child well and gently stimulate by rubbing the back or flicking the newborn's heels.
3. Suction the mouth and nose if needed.
4. If the child was noted to have meconium-stained amniotic fluid, ***and is in respiratory distress***, a quick look of the trachea with tracheal suction should be considered. Suction pressure should not exceed 100mmHG and suction should be applied no longer than 30 seconds.
5. Assess the child's respiratory effort and pulse.
6. If the child has not begun to breathe spontaneously within 5 to 10 seconds or if the child is breathing but has a heart rate less than 100 bpm then provide positive pressure ventilation at a rate of 40 to 60 breaths per minute. Use caution not to ventilate too forcefully.
7. Reevaluate the child's respiratory effort and pulse every 30 seconds.
8. If heart rate is less than 60, begin chest compressions at a rate of 100/minute.
9. If child begins:
    a. to breathe spontaneously
    b. has a heart rate over 100
    c. the child's color improves (has no central cyanosis but may have some peripheral cyanosis)
    d. resume supportive care with blow by oxygen and continued close monitoring
10. If the child's heart rate remains between 61 and 100:
    a. Continue ventilatory support with positive pressure ventilation
    b. Continue monitoring but cease compressions.
11. If the child remains apneic and persistently bradycardic despite ventilatory support and compression:
    a. vascular access should be obtained with IV/IO or umbilical line
    b. intubation should be considered
    c. NRP should be continued
12. If the FHR remains less than 60, obtain vascular access,
    a. Epinephrine First Dose
        i. 1:10000 Epinephrine 0.01 mg/kg IV/IO
        ii. 1:10000 Epinephrine 0.03mg/kg via ETT
    b. Accucheck if possible
    c. Consider 2ml/kg 10% dextrose slow IVP for hypoglycemia
13. Continue with NRP and rapid transport to appropriate facility.

Preterm Labor

Purpose/Goal: To delineate the assessment, care, and treatment of the gravid patient with uterine contractions with cervical dilation prior to 37 weeks gestation.

CCT:

1. Initial assessment and care
   - Obtain basic Obstetrical History and delivery history from referring institution or EMS providers including:
     - Gestational Age/ Due Date
     - Cervical dilation, effacement, station, status of membranes, and bleeding
     - Progression and Duration of labor
     - Gravida/Para
     - Prenatal care
     - Medical Complications with this and prior pregnancies/deliveries
   - Establish adequate IV access.
   - Assess airway to assure patency and ensure respiratory effort is adequate. Provide supplemental oxygen if pulse oximetry is less than 94%

Place patient on cardiac monitor and continuous pulse oximetry and monitor vital signs every 10 minutes. Assess pain.

a. Identify possible precipitating factors such as recent trauma, urinary tract infection, dehydration (i.e. vomiting/diarrhea) or premature rupture of membranes (PROM).
b. Assess uterine contractions for frequency, duration, and intensity using fetal monitoring, if available, or palpation and per patient report.
c. If membranes are ruptured, check for presence of prolapsed cord OR document that the sending facility has confirmed there is no evidence of prolapsed cord.
d. If prolapsed cord is identified see "Aberrant Delivery Situations: Prolapsed Cord" protocol.
e. Patient should be placed in a left recumbent position for transport.
f. Maintenance IV fluids of NS or LR at 125cc/hr if no contraindications.
g. Foley catheter

2. Tocolytic therapy may be administered by the CCT crew with direct order from sending physician or medical control as follows:
   a. Magnesium Sulfate - CNS depressant that acts by decreasing acetylcholine level blocking neuromuscular transmission (see Appendix F).
      ii. Monitor patients DTR's, vital signs and LOC for early evidence of CNS side effects
      iii. Dosing
         (i.) IV loading dose: 4 gm in 50cc D5W, administer 2 to 4grams IV as ordered over 15 to 20 minutes (max dose 6gms). Vitals, DTR's and LOC assessed every 5 minutes during the bolus.
         (ii.) IV Maintenance Drip: 40 gm in 1000cc D5W (concentration of 2 grams per 50 ml) Start drip at 2 gm/hour or as ordered by physician. (1gm/hr = 25ml/hr, 2gm/hr = 50ml/hr, 3gm/hr=75ml/hr)

      iv. Toxicity

(i) Manifested by drowsiness, depressed reflexes, hypothermia, hypotension, flushing, circulatory compromise, diaphoresis, hypocalcemia, pulmonary edema

(ii) Overdose Symptoms- loss of DTR's, hypoventilation, respiratory failure,

1. ***Treatment of Overdose Calcium Gluconate 10% 10cc slow IVP over 5 minutes may repeat with physician order after 10 minutes***

b. Terbutaline - Beta sympathomimetic agent that stimulates beta -2 adrenergic receptors in uterine muscle inhibiting contractions

i. Dosing

(i) ***Subcutaneous:*** Terbutaline 0.25mg subcutaneously every 20 minutes

(ii) ***Oral:*** Terbutaline 2.5 mg – 5 mg by mouth every 4 to 6 hours

(iii) ***Intravenous:*** Terbutaline 12.5mg in 250ml D5W, start infusion pump at 12ml/hr titrate by increasing 6ml/hr every 15 to 20 minutes as needed to a maximum dose of 96ml/hr, cessation of contractions, patient intolerance, maternal heart rate >130bpm.

ii. Toxicity

(i) Manifested by nervousness, tremor, drowsiness, dizziness, headache, weakness, palpitations, tachycardia, arrhythmia, flushing, vomiting, nausea, and heartburn

Management of Pre-Eclampsia

Purpose/Goal: Delineate the assessment, care, and treatment of pre-eclampsia and eclampsia.

CCT:

Initial Assessment

1. Obtain basic obstetric history
    a. Gestational Age
    b. Gravida/ Para
    c. Prenatal care
    d. Medical Complications
2. Reduce external stimuli as much as possible
3. Check vital signs every 10 minutes and PRN
4. Report to receiving physician any abnormal vital signs or changes in patient condition during transport including:
    a. Pulse >100
    b. Resp Rate >28
    c. BP >140/90
    d. Signs of pulmonary Edema, decreased breath sounds, rales, wheezing, frothy sputum, chest tightness, cough
    e. Pulse Oximetry <94%
    f. Any abdominal pain
    g. Abnormal lab values noted at sending facility (if available) specifically:
        i. Low platelets
        ii. Elevated liver enzymes (AST/ALT)
        iii. Elevated uric acid
        iv. Elevated LDH
5. Monitor fetal heart tones, if possible
6. Monitor duration, interval, and intensity of contractions, if occurring
7. Rapid transport
8. Notify Medical Control or Receiving physician of any significant changes in patient condition.
9. If 24 hour urine in process at sending hospital, bring specimen back to the receiving facility.

Treatment – Pre-eclampsia

1. Continue treatments instituted prior to arrival (after confirmation from medical control)
2. Place patient left lateral recumbent position
3. Seizure precautions
4. Establish adequate IV access
5. Assess airway to assure patency and ensure respiratory effort is adequate. Provide supplemental oxygen if pulse oximetry is less than 94%
6. Place patient on cardiac monitor and continuous pulse oximetry
    - Blood Pressure control may be needed for SBP >140 DBP >100
7. Medications ***WITH PHYSICIAN ORDER ONLY*** may include:
    a. ***Magnesium Sulfate*** - CNS depressant that acts by decreasing acetylcholine level blocking neuromuscular transmission used for treatment of pre-eclampsia and eclamptic seizures

i. Monitor patients
   - DTR's, vital signs and LOC for early evidence of CNS side effects

ii. Dosing:
   - IV loading dose: 4GM in 50ml D5W administer 2 to 4grams IV as ordered over 15 to 20 minutes per infusion pump (max dose 6gms). Vitals, DTR's and LOC assessed every 5 minutes during bolus
   - IV Maintenance Drip: 40GM in 1000ml D5W concentration of 2grams per 50ml start drip at 2gm(50ml) /hour or as ordered by physician (1gm/hr = 25ml/hr, 2gm/hr = 50ml/hr, 3gm/hr=75ml/hr)

iii. Toxicity:
   - Manifested by drowsiness, depressed reflexes, hypothermia, hypotension, flushing, circulatory compromise, diaphoresis, hypocalcemia

iv. Overdose Symptoms- loss of DTR's, hypoventilation, respiratory failure
   - **Treatment of Overdose Calcium Gluconate 10% 10cc slow IVP over 5 minutes. May repeat with physician order after 10 minutes.**

b. Hydralazine – antihypertensive, direct vasodilator mainly arterioles. Will cause reflex tachycardia.
   i. Monitoring – frequent vital signs
   ii. Dosing:
      - 2.5 – 10 mg IV every 15 minutes per order

c. Labetolol – antihypertensive beta blocker with some alpha effects
   i. Monitoring frequent vital signs watch for bradycardia
   ii. Dosing:
      - 10 to 20 mg slow IV over 2 minutes
      - Hold for pulse less than 60

d. Zofran –antiemetic
   i. Dosing:
      - 4mg IV X 1 prn nausea. May repeat X 1 for persistent symptoms.

Treatment – Eclampsia with Tonic-Clonic Seizures

CCT:

1. If the patient develops eclamptic tonic clonic seizures:
    a. If patient has not yet received magnesium initiate Magnesium Sulfate Bolus of 4grams IV, followed by a 2gm/hr drip
    b. If patient is currently on a Magnesium drip initiate 2 grams Magnesium Sulfate IV bolus
2. Contact medical control immediately to notify of change in condition and for further orders.

3. If unable to reach medical control, and no response to Magnesium bolus, and patient has continued seizure activity, respiratory or cardiovascular compromise:
    a. Repeat a 2gram MgSo4 IV bolus

    b. Consider giving:

        i. Lorazepam (Ativan) - 1mg IV push may be repeated every 5 minutes to max dose 6mg for continued seizure activity

    c. Frequently reassess the patient's airway and respiratory effort secure airway as indicated by the patient's clinical condition if post-ictal try conservative measures first.

Definitions

Preeclampsia is a syndrome with a constellation of symptoms affecting multiple organ systems and is rare before 20 weeks but can occur up to 1 month post partum occurring in up to 5% of pregnancies. Just over 30% of the cases occur at term, intrapartum or within 48 hours of delivery. The primary pathologic changes are ischemic in nature and affect the placenta, kidneys, liver and brain. It is manifested by hypertension with a constellation of associated symptoms such as headache, blurred vision, swelling of face or hands, abdominal pain, abnormal labs including proteinuria, thrombocytopenia, and abnormal enzyme levels. ***The hypertension is defined as being greater than 140/90 for a patient who was normotensive prior to 20 weeks.***

Severe pre-eclampsia is defined as a blood pressure of 160/110 mm/Hg with evidence of renal insufficiency or HELLP (**H**emolysis, **E**levated **L**iver enzymes and **L**ow **P**latelets)

Ecclampsia is the development of generalized tonic-clonic seizures or coma in the setting of preeclampsia occurs in 0.5% of mildly pre-eclamptic patients and 3% of severely pre-eclamptic patients

Vaginal Bleeding in the Second and Third Trimester

Purpose/Goal: To delineate the assessment, care, and treatment of vaginal bleeding in the pregnant patient after the first trimester.

CCT:

1. Initial assessment and care:
   a. Obtain basic obstetric history:
      i. Gestational age
      ii. Gravida
      iii. Para
      iv. Prenatal care
      v. Medical complications
   b. Establish adequate IV access
   c. Assess airway to ensure patency
   d. Evaluate respiratory effort and provide supplemental oxygen
   e. Place patient on cardiac monitor and continuous pulse oximetry
   f. NEVER PERFORM INTERNAL VAGINAL EXAM
   g. If signs of shock: initiate fluid bolus with NS or LR.
   h. Check vital signs every 10 minutes and PRN.
   i. Monitor duration and frequency of contractions
   j. Monitor fetal heart tones if possible
   k. If transport is interfacility with no OB services available at transferring hospital, consider blood transfusion for hypotension that is unresponsive to 2000 ml fluid bolus or hemoglobin less than 7-10 gm/dl. Call Medical Control or consult with sending physician for orders.
   l. Place patient in left lateral recumbent position
   m. Rapid transport
   n. Notify Medical Control or Receiving Physician of any significant changes in patient condition
2. **Placenta Previa-**Abnormal implantation of the placenta resulting in the placenta partially or completely covering the cervical opening.
   a. Hallmark sign – painless vaginal bleeding
   b. NEVER PERFORM A VAGINAL EXAM on these patients
   c. Patients can lose large volumes of blood and deteriorate quickly
   d. Patients with a prior history of previa have a 4-8% recurrence rate
   e. Monitor closely for signs of shock
      - pallor
      - anxiety
      - dyspnea
      - confusion
      - cool skin and poor perfusion
      - tachycardia-late sign
      - hypotension-late sign

3. **Placental Abruption-**Separation of the implanted placenta from the uterine wall. Can be spontaneous or the result of trauma or abuse of drugs.

a. Complications include:
   - Hemorrhage
   - DIC
   - Amniotic fluid embolism

b. Hallmark sign is PAINFUL vaginal bleeding

c. May also have uterine tenderness, tetanic uterine contractions, or low back pain that starts as a sudden sharp pain and then resolves to a dull aching pain.

d. Visible blood loss may be obvious and copious, scant, or absent with this condition. Actual blood loss may be far greater than observed bleeding.

e. Risk factors include:

   - smoking
   - cocaine/amphetamine abuse
   - trauma
   - hypertention (especially if poorly controlled)

f. ***For patients with placental abruption and thrombocytopenia*** <50,000/microL and serious bleeding or planned cesarean section consider administration of platelets with physician order.

g. ***Negative sonogram does not exclude abruption if clinical suspicion is high*** positive sonographic findings of abruption such as retro-placental hematoma have a high positive predictive value.

h. ***For patients with placental abruption and coagulopathy*** (PT/PTT increased by 1.5X) or low fibrinogen <150mg/dl consider administration of cryoprecipitate or FFP.

i. Additionally for the patient with known placental abruption with significant hemorrhage requiring multiple transfusions>4 units PRBCs, consider FFP and platelet replacement with physician order.

j. Consider TXA administer per 911 protocol.

Post-Partum Hemorrhage

Purpose/Goal: To delineate the assessment, care, and treatment of post partum hemorrhage.

CCT:

a. Obtain basic obstetric history and delivery history from referring institution or EMS providers if possible:
   i. Gestational Age
   ii. Gravida/Para
   iii. Prenatal care
   iv. Medical Complications
   v. Complications with delivery.
b. Establish adequate large bore IV access
c. Assess airway to ensure patency, adequacy of respiratory effort, and provide supplemental oxygen
d. Place patient on cardiac monitor and continuous pulse oximetry
e. Examine the patient and estimate the blood loss. ≥500cc is considered significant. Active bleeding with signs of circulatory compromise (hypotension, tachycardia, dizziness, altered mental status, poor perfusion with delayed capillary refill) is also considered significant.
f. Determine if the placenta has delivered, and if so, examine it to assure it is intact
g. Routine vaginal exams should not be performed by the CCT crew
h. Initiate fluid bolus with NS or LR if signs of shock, hypotension (SBP<90), tachycardia, altered mental status, pallor, delayed capillary refill, decreased urine output <30cc/hr
i. Administer TXA per 911 protocol
j. Check vital signs every 10 minutes and PRN
k. Perform fundal massage and assess vaginal bleeding every 10 minutes.
l. If no OB services are available at the sending facility, consider blood transfusion for:
   i. hypotension unresponsive to 2 liter saline bolus
   ii. hemoglobin less than 7 to 10gm/dl
m. call medical control or consult with sending physician for orders
n. Place patient left lateral recumbent
o. Rapid transport. If on scene at a facility with no surgical or obstetric resources do not delay transport of the patient while attempting to control bleeding. Control bleeding en route to the tertiary care facility
p. Notify Medical Control or Receiving physician of any significant changes in patient condition

2. Management
   i. Non-operative interventions

i. Uterine fundal massage
ii. Examine the perineum for obvious sources of active bleeding and apply direct pressure
iii. Routine vaginal exams should only be performed by attending physican/surgeon
iv. IV fluid resuscitation
v. Uterotonic Medications with physician order - these medications should not be used until placenta has delivered
   1. Oxytocin 30units in 500ml Normal Saline
vi. Blood and Blood Product Transfusion

- Consider transfusion PRBC's for persistent hypotension signs of shock despite adequate fluid resuscitation >2 liters crystalloid in setting of serious hemorrhage
- ***For patients with placental abruption and thrombocytopenia*** <50,000/microL and serious bleeding or planned surgery
- ***For patients coagulopathy*** (PT/PTT increased by 1.5X) or low fibrinogen <150mg/dl consider cryoprecipitate or FFP
- Significant hemorrhage requiring multiple transfusions >4 units PRBC's consider FFP and platelet replacement with physician order. Or alternatively a formula of one unit of FFP for every 2 units PRBC's

b. Operative interventions - at the discretion of the sending physician/surgeon avoid transport of actively bleeding, hemodynamically unstable patient if sending facility has surgical management capabilities.

Definitions – Post Partum Hemorrhage

- Causes
  - Uterine Atony
    - Most common cause
    - Lack of effective contraction of the uterus after delivery
    - Occurs in 1 in 20 births
    - Responsible for 80% of cases of post-partum hemorrhage
    - Caused by
      - Uterine infection
      - Over distension of the uterus –multiple gestations
      - Drugs –uterine relaxants
      - Uterine fatigue from prolonged labor
      - Uterine inversion
      - Retained placenta
      - Full bladder
    - Assess for this by palpating the uterine fundus after delivery it should be firm and contracted
  - Trauma
    - From perineal, vaginal, cervical or uterine lacerations, incisions, or uterine rupture
  - Coagulopathy can be acquired or congenital
    - Acquired
      - Placental Abruption
      - Severe Pre-eclampsia
      - Sepsis
      - Fetal Demise
      - Amniotic Fluid embolus
      - HELLP Syndrome
      - Consumptive Coagulopathy/DIC

Prolapsed Cord

Purpose/Goal: Delineate the assessment, care, and treatment of gravid patient with a prolapsed umbilical cord.

CCT:

1. Obtain basic obstetric history and delivery history from referring institution or EMS providers if possible

    - Gestational Age
    - Gravida/ Para
    - Prenatal care
    - Medical Complications

2. If during secondary exam a prolapsed umbilical cord is identified immediately assess the cord for pulsation and assess for fetal heart tones.
    i) ***Absence of pulsation in the cord is not a reliable indicator of fetal demise so note whether pulsation is present, but continue your interventions regardless.***
3. Place the mother on all fours in a knee chest position or trendelenberg and relieve the pressure of the presenting part on the cord by inserting two fingers of a gloved hand into the vagina and elevating the presenting part off of the cord by placing one finger on either side of the cord.
    i) DO NOT attempt to reduce the prolapse.
    ii) Instruct the mother NOT to bear down or push but to pant through the contractions.
4. If at sending facility with surgical or obstetric capability immediately inform the sending physician of the presence of a prolapsed cord and possible need for emergent c-section.
    i) IV access if possible.

Prolapsed Cord

- Contributing factors
    - Malpresentation (Breech, Limb etc)
    - Multiple births
    - Large baby
    - Prematurity/PROM
    - Polyhydramnios
    - Long Cord
- Prevalence 1/200 pregnancies

Can be ***overt*** --cord is palpable or visible in vaginal vault or ***occult*** – cord descends alongside but not past presenting part can occur with intact membranes requires clinical suspicion in setting of sudden prolonged decelerations

Breech Presentation

Purpose/Goal: To delineate the assessment, care, and treatment of a gravid patient with a breech presentation.

CCT:

1. Initial assessment and routine care of the gravid patient
    i. Obtain basic obstetric history and delivery history from referring institution or EMS providers if possible – Gestational Age/Gravida/ Para/ Prenatal care/Medical Complications
2. See "Imminent Vaginal Deliveries" protocol.
3. Recognize malpresentation during the process of an imminent delivery.
    i. If the presenting part is a limb or shoulder, the delivery will be unable to be completed and rapid transport is indicated (if OB or surgical capability is unavailable).
4. Place the patient in reverse trendelenberg or knee-chest position to relieve pressure on the perineum and transport to the nearest capable facility. Call the receiving physician with patient status (if patient is being transferred for an obstetrician or an obstetrician has been consulted).
5. If delivery is imminent and: the baby is frank or complete breech and the presenting part is buttocks
    i) NEVER PULL.
    ii) Safe delivery depends on patience, not traction.
    iii) Allow the baby to emerge to the level of the umbilicus, the thighs will be flexed against the baby's abdomen.
    iv) To deliver the legs, if they do not emerge spontaneously, externally rotate the thigh while rotating the fetal pelvis in the opposite direction. (i.e. for the right leg, rotate the fetal pelvis counterclockwise while externally rotating the baby's thigh at the hip).
    v) At this point, wrap the child in a sterile towel to improve your grip.
    vi) When the scapula appear, reach up over the shoulders from the back following the humerus and with a medial to lateral movement sweep the arms across the child's chest and out of the perineum. Gentle rotation counterclockwise will assist with delivery of the right arm/shoulder and gentle rotation clockwise will assist with delivery of the left arm/shoulder.
    vii) Once the arms are delivered, if the vertex has remained flexed on the neck, the chin and face will appear at the pelvic outlet and the airway can be cleared and suctioned.
    viii) If the head does not deliver spontaneously, place one arm along the anterior trunk with the palm upwards and use the ring and index fingers to apply gentle downward pressure on the baby's maxilla to encourage head flexion while using the middle finger to open and maintain the child's airway. Slide the opposite hand along the back to apply gentle pressure on the child's occiput to encourage head flexion. Gentle suprapubic pressure may also be applied by a partner to encourage delivery of the head.
    ix) Once the child is delivered refer to "Imminent Vaginal Delivery" protocol and "Newborn Resuscitation" protocols.

Contact medical control at any time for further directions as needed

Diabetic Ketoacidosis – Pediatric

Purpose/Goal: To identify treatment parameters for the pediatric patients who present with Acute Diabetic Ketoacidosis.

CCT:

A. DKA is defined as
   i. A patient with known or suspected Diabetes Type I or II
   ii. Blood sugar over 200
   iii. Anion Gap Metabolic Acidosis defined as
      i. Mild DKA
         1. Venous pH <7.3
         2. Plasma bicarbonate of <15
      ii. Moderate DKA
         1. Venous pH 7.1 to 7.2
         2. Plasma bicarbonate <10
      iii. Severe DKA
         1. Venous pH <7.1
         2. Plasma bicarbonate <5
   iv. Presence of Hyperketonemia
   v. No other known or suspected source for the metabolic acidosis

B. Care of the patient in acute DKA
   i. Routine cardiac care
   ii. Review labs from sending facility including blood gas if available
   iii. Consider and address any identified triggering event ---UTI, Pneumonia
   iv. Perform bedside blood glucose testing
      i. On initial evaluation
      ii. Every 15 minutes for the first hour on the Insulin drip
      iii. Every hour after stable on Insulin drip.
      iv. As indicated by patient condition
      v. Do not decrease blood glucose by more than 100 mg/dl/hr
   v. Administer oxygen and secure airway as necessary.
      i. Caveat: Because of their metabolic acidosis almost all patients in DKA will have an increased respiratory rate that often correlates with the severity of their acidosis.
      ii. If these patients are alert and oriented intubation for tachypnea alone would not be prudent if the patient is tolerating the effort.
   vi. Review treatments provided prior to transport team arrival including the amount of fluid resuscitation given and any medications provided.
   vii. Initiate or continue Regular Insulin Drip at 0.1 units/kg/hour
   viii. Perform patient assessment with specific attention to neurologic status
      i. Risk Factors for Cerebral Edema
         1. Age <5
         2. Use of bicarbonate
         3. New Onset Diabetes
         4. Severe Acidosis
         5. High BUN (severe dehydration)
      ii. Criteria for Diagnosis of Acute Cerebral Edema

1. Minor Criteria
    a. Vomiting
    b. Headache
    c. Lethargy or inability to wake
    d. Agitation, Combative (older kids)
    e. Fussiness or Irritability (younger children infants)
    f. Hypotension
    g. Age <5 years
2. Major Criteria
    a. Altered or Fluctuating Mental Status
    b. Sustained Heart Rate deceleration over 20 bpm lower than baseline not attributed to appropriate response to fluid resuscitation or sleeping child
    c. Age inappropriate incontinence
3. Diagnostic Criteria
    a. Abnormal Verbal or motor response to pain
    b. Posturing decorticate or decerebrate
    c. Cranial Nerve Palsy -especially CN's 3,4 or 6
    d. Abnormal Respiratory Pattern
        i. Cheyne-Stokes, Apneusis, Grunting, Bradypnea
4. Treat Cerebral Edema if
    a. Any diagnostic criteria are present
    b. Two major criteria are present
    c. One major criteria and two minor criteria are present
    d. Or as directed by the receiving Pediatrician
5. Cerebral Edema Aggressive Management:
    a. IV Mannitol 0.25 to 1 gm/kg IV push repeat in 20 min if necessary
    b. IV 3% saline 5-10 ml/kg over 30 minutes, repeat in 20 min if necessary-**with physician order only**

ix. Administer IV 0.9% NS 20cc/kg bolus for hypotension or signs of poor perfusion an additional bolus of 10ml/kg of normal saline may be given for persistent hypotension or poor perfusion. Maximum IV fluid bolus: 40 ml/Kg.

x. Run IV fluids at 1 1/2 Maintenance rate

1. Add Dextrose to fluids when BS < 300
    a. Change fluids to D5NS or D10NS
2. NS with 20 mEq KPO4 with 20 mEq K acetate or KCL
    a. THERE SHOULD BE NO POTASSIUM in IVF IF
    b. No urine output, renal failure, or hyperkalemia >5.5 mMol/L is suspected or present
3. For a rapid decrease in blood glucose, administer D10NS or D10 0.45 NS
4. Monitor glucose every 30-60 minutes during transport

Seizure – Status Epilepticus (Pediatric)

Purpose/Goal: To define parameters for care for care for the pediatric patient in status epilepticus defined as generalized convulsions lasting 5-10 min or longer **OR** 2 or more successive convulsions without any recovery of consciousness between them.

CCT:

1. Routine Cardiac Care.
2. Secure and maintain airway; assist ventilations as necessary.
3. Assess blood sugar, perform fingerstick glucose and treat hypoglycemia
4. Identify and treat fever
    a. Acetaminophen 15 mg/kg PO/PR,
        1. max dose 1gram
        2. Avoid in Hepatic Disease or impairment
    b. Ibuprofen Chewable (1 tablet=100mg)
        i. 24-35 lbs – 1 tablet
        ii. 36-47 lbs – 1.5 tablet
        iii. 48-59 lbs – 2 tablets
        iv. 60-71 lbs – 2.5 tablets
        v. 72-95 lbs – 3 tablets
5. Establish/Confirm vascular access
6. If blood sugar <60, administer:
    a. For child <1 month old, give D10, 5-10 ml/kg.
    b. For child up to 5 years, give D25, 2-4 ml/kg.
    c. For child >5 years, give D50, 1-2 ml/kg.
7. Medication choices:
    a. If you have vascular access
        i. Lorazepam (Ativan) 0.1 mg/kg slow IVP/IO. May repeat every 5 minutes with a max of 4mg/dose or 10mg total. Monitor for respiratory depression. Dilute drug with NS before administering.
        ii. Alternatively may use
            1. Versed 0.1mg/kg IV/IM/IO
    b. If you DO NOT have vascular access
        i. Midazolam (Versed)
            1. Intranasal 0.2 mg/kg
            2. IM 0.1-0.2 mg/kg
    c. If seizures are uncontrollable by above medications after 5 to 10 minutes
        i. For infants <3 months
            1. Phenobarbital 20mg/kg IV/IO
                a. Max dose is 40mg/kg total
        ii. For Infant/Child >3 months choose one of the following
            1. Fosphenytoin (Cerebyx) 20mg PE/kg* IV/IO at 1mg/kg/minute. Give at rate not >50mg/min. Maximum 1 gm/kg in 24 hours.
            2. Keppra 20-30 mg/kg IV/IO at 5mg/min
    d. If seizures continue for another 5 to 10 minutes despite the above therapy
        i. Midazolam (Versed) 0.06 to 0.15 mg/kg IV/IO followed by a continuous infusion at 0.06 to 0.4 mg/kg/hour

e. If seizures persist despite prior treatment, call for medical direction and consideration of Pentobarbital or Ketamine Infusion
f. Address lab abnormalities call for medical direction for low Na and Ca for orders
    i. Hypoglycemia <60: SEE ABOVE #5 a-c
    ii. Hypocalcemia: calcium gluconate 50 mg/kg
    iii. Hyponatremia <120 : 3-5 ml/kg 3% saline over 30 min

- Fosphenytoin is dosed in Phenytoin Equivalents (PE).
- CCT crew does not routinely carry Ibuprofen, Fosphenytoin, Keppra, or Phenobarbitol. These medications should be obtained from the sending facility's pharmacy if needed by order of sending physician order. Medical Control can be contacted for additional treatment options if medication is not available.

Humidified Heated High Flow Nasal Cannula (HHHFNC)

Purpose/Goal:

To establish guidelines for Humidified Heated High Flow Nasal Cannula Oxygen support during CCT interfacility transports.

Policy Statements:

In patients suffering respiratory distress or respiratory failure, the HHHFNC offers an alternatives to low flow oxygen therapy and may diminish the need to progress to non-invasive positive pressure ventilation. The goal is to meet or exceed the patient's Peak Inspiratory Demand, which creates minimal air dilution. The HHHFNC system has the ability to provide heated humidified high flow mix of oxygen and air via a specialized system and cannula.

Unlike conventional oxygen administration or NPPV, the inspired gas is warmed, humidified and often better tolerated than an NPPV occlusive mask. HHHFNC may well relieve hypoxemia but does not improve ventilation or treat the underlying cause of the hypoxemia. The goal of HHHFNC is to reduce the work of breathing and improve oxygen saturation.

Most of the time the transferring hospital will have initiated this treatment and the settings should be duplicated, if the patient has improved and is tolerating it well.

Indications:

- Exacerbation of COPD
- Pneumonia
- Bronchiolitis
- Asthma
- Mild cardiac failure
- Pulmonary edema with adequate spontaneous ventilation
- Acute lung injury including:
    - Lung contusions
    - Chest trauma
    - Fractured ribs
    - ARDS
- Other respiratory conditions diagnosed by the receiving facility of which treatment has started

Contraindications:

- CO2 greater than 55 mmHg by arterial blood gas
- Significant mid axillary facial trauma
- Suspected pneumothorax
- Any patient requiring ventilator support

Preparation:

1. The Airvo 2 should be securely mounted on a pole (IV pole on cot) below the level of the patient's head and connected to a power supply, i.e. on board inverter, hospital AC supply, or portable power supply.

2. Install the water chamber
    a. Remove the blue port caps from the chamber by pulling the tear tab upwards then remove the bracket holding the water supply tubing.
    b. Fit the supplied adapter over the two vertical ports on the chamber and push on firmly.
    c. Clip the water supply tube into position.
    d. Fit the chamber into the unit by pressing down the finger guard and slide the chamber on, carefully aligning with the blue chamber port ends.
    e. Push the chamber on firmly until the finger guard clicks into place.
3. Connect the water bag
    a. Hang the sterile water bag 8 inches above the unit and pushed the spike end on the tubing into the bag.
    b. Open the vent cap on the side of the bag spike.
    c. The chamber will now automatically fill to the required level and maintain that level until the water bag is empty.
4. Install the heated breathing tube
    a. One end of the breathing tube has a blue plastic sleeve. Lift the sleeve and slide the connector onto the unit.
    b. Push the sleeve down to lock.
5. Select the patient interface
    a. If applicable, use the cannula on the patient and attach it to the breathing tube.
    b. Select the appropriate cannula based on patient size.
    c. Cannula size should be no more than 50% of the diameter of the nares.

Operation

1. Switch the unit on.
    a. Allow time for the unit to achieve the desired temperature prior to placing on the patient.
2. Check disinfection status
    a. The unit will show if it is safe to use on a patient.
3. Warm up
    a. The unit will begin to warm up. You will see numbers showing the current output dew-point- temperature, flow, and oxygen values. These numbers will pulse until they approach their target settings.
4. Junior mode
    a. If the treatment is for an infant or pediatric patient (OPT316 or OPT318) the Junior mode must be used.
    b. Generally speaking, most patients over 10 years old will be treated in the adult mode but ultimately the cannula is determined by size of the nare.
    c. Junior mode limits the target settings to:
        i. 34° C
        ii. 2-25 LPM in increments of 1 L
    d. To activate the Junior mode, hold the Mode button for 5 seconds
5. Configure target settings
    a. Target dew-point

i. For adults, 37° C, but may be reduced to 34° C if patient does not tolerate it.
ii. Junior mode is limited to 34° C
iii. To unlock and change the target dew-point, press and hold the up and down arrows at the same time for 3 seconds.
iv. The lock will disappear on the screen and you may adjust the setting within the parameters.
v. When complete, press the Mode button to lock the setting.

b. Target flow
   i. Target flow for adults is 10-60 LPM, realistically in increments of 1 LPM for 10-25 LPM and 5 LPM for 25-60 LPM.
   ii. In most cases, utilize the flow rate determined by the transferring facility.
   iii. Titrate flow rate based on patient's shortness of breath. Increase the flow rate until the patient is on the verge of "uncomfortable", which usually indicates they have reach their flow demand.
   iv. Junior mode is 2-25 LPM in increments of 1 LPM.
   v. Pediatric flow is based on weight in kg. (see chart, Fig. 1)

c. Oxygen
   i. Oxygen is attached to the unit via the inlet port and should be firmly attached
   ii. Oxygen flow can be delivered from 2-60 LPM
   iii. Adjust the level of oxygen from the regulator until the desired oxygen fraction is displayed on the screen. Usually, start high on FiO2 then titrate to SpO2 of >90%.

d. Connect the patient
   i. A "check mark" will appear on the screen indicating the unit is ready to use.
   ii. Attach the breathing tube to the cannula and apply to the patient.

e. During use
   i. Monitor patient SpO2, respiratory rate, and work of breathing
   ii. Flow and oxygen may be adjusted to meet the needs of the patient, if needed.

If work of breathing increases or patient is unable to ventilate effectively, consider NPPV or IPPV.

Tier III

Intra-Aortic Balloon Pump

The Intra-aortic balloon pump (IABP) is a mechanical device that increases myocardial oxygen perfusion while at the same time increasing cardiac output. Increasing cardiac output increases coronary blood flow and therefore myocardial oxygen delivery. It consists of a cylindrical polyethylene balloon that sits in the aorta, approximately 2 centimeters (0.79 in) from the left subclavian artery and counter pulsates. That is, it actively deflates in systole, increasing forward blood flow by reducing after load. It actively inflates in diastole, increasing blood flow to the coronary arteries. These actions combine to decrease myocardial oxygen demand and increase myocardial oxygen supply.

Indications:

A. Left ventricular failure or cardiogenic shock.
B. Mechanical complications of Acute MI.
C. Post MI ventricular irritability.
D. Unstable angina refractory to medical therapy.
E. Support for high risk PTCA patients.
F. Failed PTCA.
G. Thrombolytic therapy of acute MI.
H. Failure to wean from cardiopulmonary bypass.
I. Low-output syndrome.
J. Stabilization of high risk patients undergoing general anesthesia.
K. Bridge to heart transplant.
L. Stunned myocardium.

Contraindications:

A. Severe aortic valvular insufficiency.
B. Aortic dissection.
C. Severe peripheral vascular disease.
D. Irreversible brain damage.

Complications:

A. Vascular:
    a. Arterial injury (perforation or dissection).
    b. Femoral artery thrombosis.
    c. Peripheral embolization.
    d. Femoral vein cannulation.
    e. Limb ischemia.
    f. Visceral ischemia.
B. Balloon:

a. Perforation.
b. Tear.
c. Rupture.
d. Incorrect positioning.
e. Gas embolization.

C. Miscellaneous:
a. Hemorrhage.
b. Infection.
c. Entrapment.

Standing Orders:

A. Follow written orders of transferring physician.
B. Contact Medical Control of any complications during transport.

Extracorporeal Membrane Oxygenation

Indications:

A. Patients with the following 2 major neonatal diagnoses require the use of ECMO:

1) Primary diagnoses associated with primary pulmonary hypertension of the newborn (PPHN), including idiopathic PPHN, meconium aspiration syndrome, respiratory distress syndrome, group B streptococcal sepsis, and asphyxia

2) Congenital diaphragmatic hernia (CDH)

Contraindications:

A. The failure to meet selection criteria discussed in Indications for Extracorporeal Membrane Oxygenation, above, is a relative contraindication for ECMO.

B. Unlike the situation in neonates, when ECMO is considered in a pediatric patient, no clear set of inclusion or exclusion criteria exists. Evaluation of a pediatric patient for ECMO support is largely based on an assessment of the patient's condition and the institutional experience with pediatric ECMO.

Complications:

A. Mechanical:

1) Clots in the circuit are the most common mechanical complication (19%). Major clots can cause oxygenator failure, consumption coagulopathy, and pulmonary or systemic emboli. More recently, heparin-coated extracorporeal membrane oxygenation (ECMO) systems have been used to decrease the frequency of this complication.

2) Cannula placement can cause damage to the internal jugular vein, which causes massive mediastinal bleeding. Dissection of the carotid arterial intima can lead to lethal aortic dissection.

3) Air in the circuit can range from a few bubbles to a complete venous air lock. This air can originate in the dislodgement of the venous cannula, a small tear in the membrane, or high partial pressure of oxygen in the blood. A large bolus of air can be fatal.

4) Oxygenator failure is defined either as decreased oxygen or carbon dioxide transfer or as the presence of consumptive coagulopathy. A failing membrane should be replaced immediately.

5) Cracks in the connectors and tube rupture have become less serious problems since the introduction of tubing.

6) Pump malfunction may be a manifestation of inadequate venous return to the pump; heat exchanger malfunction can cause severe hypothermia.

7) Failure of the entire circuit, including the oxygen source and oxygen blenders, may occur, as may failure of circuit-monitoring equipment. In cases of circuit failure, immediately clamp the venous line, open the bridge, and clamp the arterial line to remove the patient from the ECMO. Because the patient is ventilator dependent, immediately bag the patient with 100% oxygen (FiO_2 =1) or shift the patient back to pre-ECMO ventilator settings.

B. Medical:

1) Neurologic complications include seizures. Intracranial bleeds and infarction may be due to ligation of the carotid artery and internal jugular vein, systemic heparinization, thrombocytopenia, coagulopathies, or systolic hypertension.

2) Hemorrhagic complications include hemorrhages and a decreased platelet count. Hemolysis and consumption coagulopathy may occur. Hemorrhage at the surgical site, at the cannula site, or into the site of a previous invasive procedure is a frequent complication because of systemic heparinization. Intrathoracic, abdominal, or retroperitoneal hemorrhage may also occur. Decreases in the platelet count occur because of decreased production, increased consumption, sequestration, or dilution.

3) Cardiac complications include myocardial stun, which is defined as a decrease in the left ventricular shortening fraction by more than 25% with initiation of ECMO that returns to normal after 48 hours of ECMO. In addition, hypertension is a dangerous complication because of the risk of hemorrhage and stroke. Arrhythmia may occur as a result of hypoxia and electrolyte imbalance. Symptomatic patent ductus arteriosus may occur, as well as pericardial tamponade may occur.

4) Pneumothorax is a potential pulmonary complication, along with pulmonary hemorrhage.

5) Oliguria is a commonly observed renal complication during the early part of ECMO; acute tubular necrosis is observed in some patients and may require hemofiltration and dialysis.

6) GI tract complications include hemorrhage, which may occur as a result of stress, ischemia, or bleeding tendencies. Direct hyperbilirubinemia and biliary calculi may occur secondary to prolonged fasting and total parenteral nutrition (TPN), hemolysis, and diuretics.

7) Complications may also result from infection and sepsis, because the ECMO circuit represents a large intravascular foreign body, and frequent manipulation increases the risk of sepsis.

8) Metabolic complications include the following:

   a. Acidosis or alkalosis
   b. Hyperkalemia or hypokalemia
   c. Hypernatremia or hyponatremia
   d. Hypercalcemia or hypocalcemia
   e. Hyperglycemia or hypoglycemia

f. ECMO may alter serum concentration of drugs due to increased volume of distribution. Caution is warranted when narrow therapeutic drugs are administered, and dose alterations may be necessary.

9) Acute cardiorespiratory decompensation may result because of the following:

a. Pericardial tamponade (from blood or air)
b. Tension pneumothorax or hemothorax
c. Respiratory failure
d. Myocardial ischemia
e. Electrolyte imbalance
f. Massive hemorrhage (especially intracranial hemorrhage)
g. Drug effects
h. Overwhelming sepsis

Standing Orders:

A. Patients on ECMO require close monitoring of fluids and electrolytes. The high-energy requirements should be met using hyperalimentation techniques. The patient's weight increases in the first 1-3 days on ECMO because of fluid retention.

B. Follow written orders of transferring physician.

C. Contact Medical Control of any complications during transport.

Any medications or procedures not included in this document, Medical Control should be contacted to direct the Tier level of transport.

Quality Assurance and Improvement

To maintain adequate medical oversight and assure quality patient care, treatment provided by Critical Care personnel will be reviewed by the EMS Medical Director through the McLean County Area EMS System office. Critical Care calls will be reviewed for appropriateness of medical care provided, proper use of medications, and success rates for skills, i.e. ET, IV, etc. The calls will also be reviewed to assure the patients were transported by the most effective method.

Quality review plan

For new agencies, year 1 and 2 – review all calls and provide timely feedback when indicated. The EMS Office will provide the agency with an annual quality report.

For established agencies – review all calls with critical skills performed (i.e. RSI) and random audits as deemed necessary by the EMS Medical Director. Timely feedback will be provided as indicated.

RSI QA/QI – All calls in which patients receive rapid sequence induction for endotracheal intubation will be reviewed. The System QA/QI form will be completed by the Critical Care personnel after the call which will document an assessment before and after intubation, justification of the procedure, medication doses, and confirmation method of the ET. The form will be signed by the Critical Care personnel and the RN or MD receiving the patient and submitted with the run report to the EMS Office for review.

All incident reports will be reviewed by the EMS Office and appropriate actions taken as needed.

Medication References

Amiodarone (Cordarone)

Indications for use:	Atrial fibrillation, ventricular tachycardia, ventricular fibrillation
Dilution Information:	Available as 150mg/3 ml ampule.
Maximum Concentration:	6mg/ml; must be administered through a central line if giving more than 2 mg/ml.
Administration:	IV loading dose of 150 mg in 100ml over 10 minutes, may repeat once. Continuous drip is: 360mg over 6 hours. (concentration 900mg/500ml of D5W). Rate = 1mg/min or 33 ml/hour. Continuous drip after 6 hours is 0.5 mg/min or 16 ml/hour for remainder of infusion. May rebolus as needed 150 mg/100 ml of D5W over 10 minutes for breakthrough arrhythmias. Maximum cumulative dose is 2.2gram IV in 24 hours.
Cardiac Arrest Situations:	IV push in cardiac arrest situations only.
Dose:	300 mg/20 ml D5W IV push. May repeat 150 mg every 5 minutes.

Cardene (Nicardipine Hydrochloride)

Indications for use: Short term treatment of hypertension

Dilution information: Dilute 25mg/10ml vial in 240 ml NS or D5W to yield concentration of 0.1 mg/ml.

Pre-mixed Version: 40mg in 200ml yielding a concentration of 0.2mg/ml

Administration: 5mg/hour, then increase by 2.5 mg/hour every 15 minutes to desired BP reduction, or a maximum of 15 mg/hr. Reduce rate to 3 mg/hour when BP goal is achieved; adjust as necessary to maintain desired response.

Cautious Use: coronary artery disease, CHF, impaired renal/hepatic function, or portal hypertension.

Note: * Do not mix with NaHCO3 or LR

If concentration is 25mg/250ml:	If concentration is 40mg/250ml:
5 mg/hour = 50 ml/hour	5 mg/hour = 25 ml/hour
7.5 mg/hour = 75 ml/hour	7.5 mg/hour = 37.5 ml/hour
10 mg/hour = 100 ml/hour	10 mg/hour = 50 ml/hour
12.5 mg/hour = 125 ml/hour	12.5 mg/hour = 62.5 ml/hour
15 mg/hour = 150 ml/hour	15 mg/hour = 75 ml/hour

Diprivan (Propofol)

Actions: Produces dose-dependent CNS depression, hypnosis and amnesia. Has no analgesia properties.

Pharmacokinetics: Onset 9-40 seconds, duration 3-5 minutes.

Uses: Continuous sedation and control of stress responses in mechanically ventilated or respiratory-controlled adult ICU patients. For CCT purposes, Propofol is not currently recommended for long-term use in children less than 14, however it is safe as a short term sedative drip or for conscious sedation

Dosing: Maintenance rates of 10-50 mcg/kg/min. Titrate in increments of 5-10 mcg/kg/min. Typical highest dose is 75 mcg/kg/min.

If sedation is inadequate a bolus maybe administered of 0.5-1mg/kg and the infusion rate adjusted accordingly

Considerations:

1. Administer pain medication as indicated
2. Monitor patients for early signs of significant hypotension or cardiovascular depression. Patients with compromised myocardial function, intravascular volume depletion, or low vascular tone are more susceptible to hypotension. If hypotensive, consider discontinuing propofol and administering IV fluids and/or vasopressors.
3. Administer into a large vein.
4. Do not give through the same IV line as blood or plasma. Do not mix with other agents.
5. Cautious use in patients who are hypotensive, hypovolemic or hemodynamically unstable, those with lipid metabolism disorders, and patients who are not intubated/ mechanically ventilated.

Epinephrine (Adrenalin)

Indications for use: Cardiac arrest, hypersensitivity, anaphylactic shock, refractory shock and bronchospasm

Method of Administration: IV drip or dwindle Epi

IV drip - dilution: Standard Concentration

1mg of Epinephrine 1:1000 in 250ml of D5W or NS

Concentration= 4 mcg/ml

Double Concentration –less volume, longer administration

2mg of Epinephrine 1:1000 in 250ml of D5W or NS

Concentration= 8mcg/ml

IV infusion – dosage: Adult 2-10 mcg/min

Peds 0.05 mcg/kg/min to maximum dose of 0.5 mcg/kg/min

Dwindle Epi dilution: Add 1ml (0.1mg) of 1:10,000 Epinephrine to 9ml of Normal Saline

Concentration = 10mcg/ml

Administration = 10ml over 5-10min, given in 1ml aliquots PRN

-in time critical situations involving adult patients may utilize

Epinephrine 1:10,000 0.5ml slow IV q 2 to 5 minutes prn

Duration of action: Onset 3-5 minutes

Duration 20-30 minutes

Peak 20 minutes

Levophed (norepinephrine bitartrate)

Indications for use: Used for treatment of hypotension after correcting hypovolemia

Dilution information - Adults: Dilute 8mg/250ml of D5W. Yields 32 mcg/ml.

Peds: Dilute 1mg/50ml of D5W. Yields 20 mcg/ml (1mg/ml ampule).

Dosing and administration – Adults: Initially, administer 8-12 mcg/min and titrate to desired effect. Average dose is 2-4 mcg/min.

– Peds: Initial dose, 0.01 mcg/kg/min; titrate to desired effect. Average dose range is 0.01-1 mcg/kg/min.

Duration of action: Onset rapid. Duration 1-2 minutes

Maximum dose: 30 mcg/min

Magnesium Sulfate

Primary use and most common indication:

Magnesium sulfate is indicated for the treatment and prevention of hypomagnesaemia; seizure prevention in severe pre-eclampsia or eclampsia, pediatric acute nephritis; acute bronchospasm, short-term treatment of torsade de pointes; treatment of cardiac arrhythmias (VT/VF) caused by hypomagnesaemia.

Cautions to be observed during administration and common side effects:

- Symptoms may correlate with the magnesium serum level
  - >3mg/dL: depressed CNS, blocked peripheral neuromuscular transmission leading to anticonvulsant effects.
  - >5mg/dL: depressed deep tendon reflexes, flushing, somnolence
  - >12mg/dL: respiratory paralysis, complete heart block
- **CV:** hypotension
- **GI:** diarrhea, abdominal cramps, gas formation.
- **Endocrine/Metabolic:** hypomagnesaemia.
- **Neuromuscular:** muscle weakness

Monitoring: serum magnesium, deep tendon reflexes, respiratory rate, renal function, blood pressure.

Dosing for Gravid Patients:

Bolus: 4gm/50ml over 20 minutes

Continuous IV infusion: 1-4 gm/hour IV infusion with a max dose of 80 gm/24 hours.

Dilution information for continuous IV infusion: 40 gm/1000ml

1 gm/hour = 25 ml/hour

2 gm/hour = 50 ml/hour

3 gm/hour = 75 ml/hour

4 gm/hour = 100 ml/hour

Dosing for actively seizing eclamptic patient

4 gram Magnesium bolus may be given slow IV push

A second 2 gram bolus slow IV push 2 minutes later if seizure has not resolved.

Dosing for Bronchospasm:

Adult- Magnesium 2 grams IV over 20 minutes

Pediatric - Magnesium 25 to 50mg/kg IV max dose 2 grams over 20 minutes

Neosynephrine (phenylephrine)

Indications for use:	Bolus administration used for treatment of hypotension to facilitate rapid sequence intubation, administration of pain medication, and/or on-going sedation for the intubated patient.
Dilution information-	10mg of Neosynephrine should be diluted in a 100ml bag of 0.9 Normal Saline. Yields 100mcg/1ml
Dosing	Adults- 0.5-2ml every 2-5min Peds- 5-20mcg/kg/dose every 10-15min
Duration of action	20 minutes
Onset	1 minute

Nipride (Sodium Nitroprusside)

Indications for use:	Used for short term treatment of uncontrolled hypertension and left ventricular failure to reduce preload and afterload, thus increasing cardiac output.
Dilution information:	50mg in 250ml of D5W. **Must be in D5W
Method of administration:	IV infusion only
Dosing and administration:	Begin infusion at 0.3mcg/kg/min. Titrate every 2-3 minutes to desired effect or a maximum of 10mcg/kg/min.
Duration of action:	Onset 1-2 minutes Duration 1-10 minutes
Special notes:	Solution usually has a faint brownish tinge. Do not use if highly colored. Wrap container in an opaque material to protect from light. Tubing does not need to be covered.

Required medications to be maintained on Critical Care Vehicles

(Tier II or Tier III Only)

Medication	Quantity	Concentration
Dilaudid	5	1mg/ml
Propofol	2	500 Mg bottles (10mg/ml)
Succinycholine	2	20mg/ml (5ml)
Rocuronium	2	100mg/10 ml
Levophed	1	8mg/250ml
Neosynephrine	1	10mg/1ml
Fentanyl (Above and Beyond ALS)	3	100mcg/2ml