



# Cognitive Aids:

# Resuscitation of the Trauma Patient for Anesthesiologists

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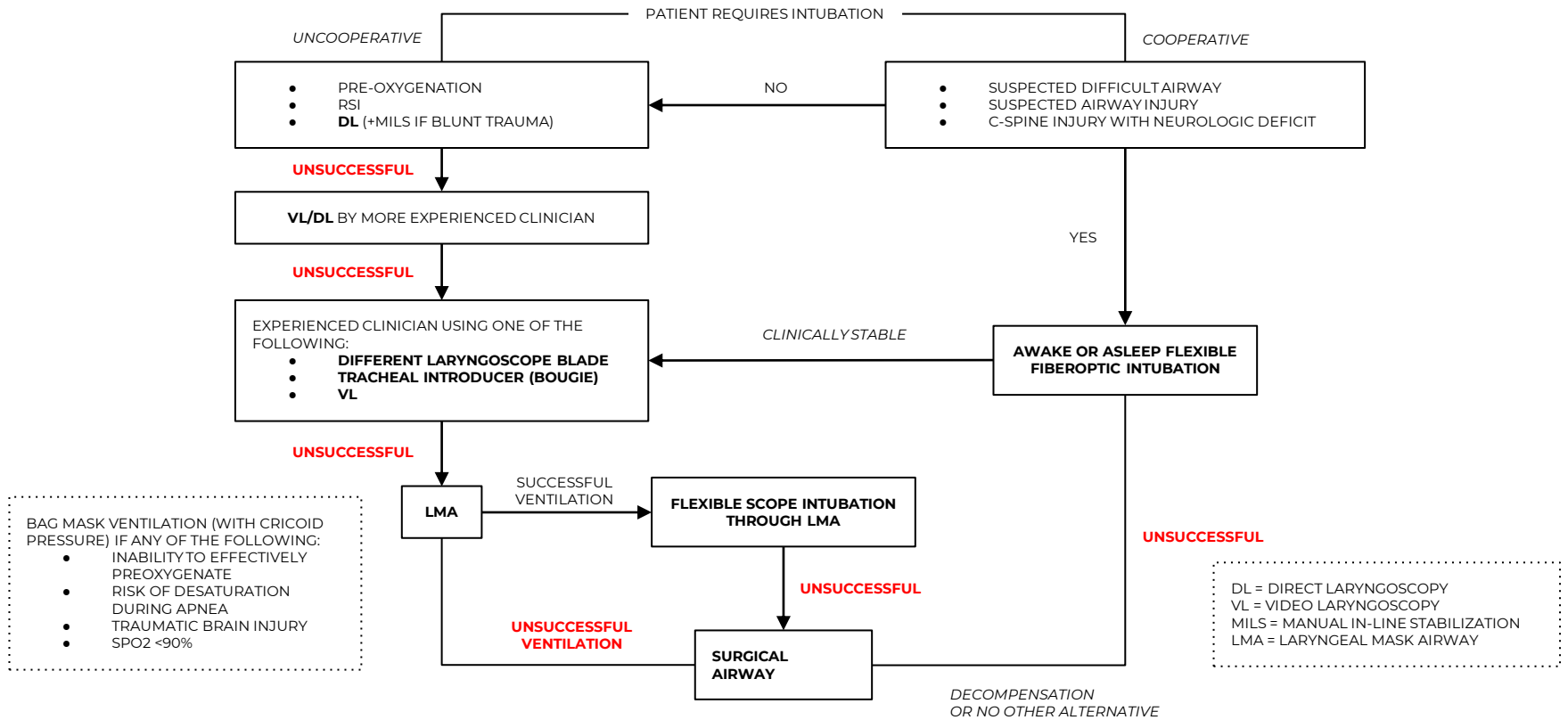
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# INITIAL TRAUMA MANAGEMENT

<p><b>PREPARATION</b></p>	<ul style="list-style-type: none"> <li>· AIRWAY EQUIPMENT (PRIMARY + BACKUP)</li> <li>· SUCTION</li> <li>· MONITORS</li> <li>· IMMEDIATE IV ACCESS</li> <li>· ASSIGN ROLES</li> </ul>
<p><b>PRIMARY SURVEY</b></p>	<ul style="list-style-type: none"> <li>· ATLS PRIMARY SURVEY (ABC's)</li> <li>· GCS</li> <li>· AUSCULTATE BREATH SOUNDS → CHEST TUBE PRN</li> <li>· COMMUNICATE AIRWAY RECOMMENDATIONS TO TRAUMA TEAM</li> </ul>
<p><b>ACCESS</b></p>	<ul style="list-style-type: none"> <li>· 2X LARGE-BORE PIV (≥18G)</li> <li>· CONSIDER IO FOR RAPID CENTRAL VASCULAR ACCESS</li> </ul>
<p><b>RAPID SEQUENCE INDUCTION</b></p>	<ul style="list-style-type: none"> <li>· CHOOSE INDUCTION DRUGS (CONSIDER ETOMIDATE, 0.1-0.3 MG/KG, KETAMINE 0.5-3 MG/KG IV, PROPOFOL 0.5-3 MG/KG)</li> <li>· CHOOSE MUSCLE RELAXANTS (SUCCINYLCHOLINE 2-3 MG/KG, ROCURONIUM 1.1 MG/KG)</li> <li>· PRE-OXYGENATE AS ABLE</li> <li>· ANTICIPATE HEMODYNAMIC INSTABILITY</li> <li>· CONSIDER POST-INDUCTION SEDATION</li> </ul>
<p><b>INITIAL RESUS</b></p>	<ul style="list-style-type: none"> <li>· 1 L WARMED CRYSTALLOID → THEN BLOOD PRODUCTS (1:1:1)</li> <li>· CONSIDER TRANEXAMIC ACID IV BOLUS IF INJURY &lt;3 HRS</li> <li>· ANTICIPATE HYPOCALCEMIA - PREVENT AND TREAT → 1-2G CA CHLORIDE/GLUCONATE OVER 5-15 MIN</li> </ul>
<p><b>SECONDARY SURVEY</b></p>	<ul style="list-style-type: none"> <li>· PUPILLARY EXAM</li> <li>· GASTRIC DECOMPRESSION</li> <li>· BLADDER CATHETERIZATION</li> <li>· FURTHER WORK-UP: eFAST, CXR, CT, LABS, ABG, VHA</li> </ul>

# TRAUMA AIRWAY



# TRAUMA MECHANICAL VENTILATION

## INITIAL VENTILATOR SETTINGS

- **MODE** PRESSURE OR VOLUME CONTROL
- **VOLUME** 6-8 ML/KG (IBW)
- **RATE** 14 BREATHS/MIN - TITRATE TO ETCO2 35-45 MMHG
- **PEEP** 5 CM H2O - TITRATE TO SPO2 ≥94%

## COMPLICATIONS

- **PNEUMOTHORAX** → NEEDLE DECOMPRESSION VS. FINGER THORACOSTOMY
- **INTRINSIC PEEP/AUTO PEEP** → DISCONNECT MOMENTARILY FROM VENTILATOR
- **TRANSFUSION ASSOCIATED CIRCULATORY OVERLOAD (TACO)** → CONSIDER DIURESIS (EXTREME CAUTION IF HYPOVOLEMIC)
- **TRANSFUSION RELATED ACUTE LUNG INJURY (TRALI)** → MANAGE IMMUNE PROCESS, INFLAMMATION

PROBLEM	DIFFERENTIAL AND MANAGEMENT	
<b>LOW SPO2</b> ("DOPE")	<ul style="list-style-type: none"> <li>• DISPLACEMENT/DISCONNECTION OF ETT</li> <li>• OBSTRUCTION OF ETT</li> <li>• PNEUMOTHORAX</li> <li>• EQUIPMENT FAILURE</li> </ul>	<ul style="list-style-type: none"> <li>→ CHECK ETCO2, CHECK CIRCUIT</li> <li>→ SUCTION ETT FOR MUCUS PLUGS OR KINKING</li> <li>→ LISTEN FOR BREATH SOUNDS, CHECK COMPLIANCE</li> <li>→ RARE, CHECK OXYGEN SOURCE</li> </ul> <p style="text-align: center;"><i>**CONSIDER RECRUITMENT MANEUVER** APPENDIX A</i></p>
<b>LOW ETCO2</b>	<ul style="list-style-type: none"> <li>• HIGH MINUTE VENTILATION</li> <li>• LOW CARDIAC OUTPUT/IMPENDING CV COLLAPSE</li> </ul>	<ul style="list-style-type: none"> <li>→ DECREASE RESPIRATORY RATE</li> <li>→ CLINICAL EVALUATION OF PATIENT</li> </ul>
<b>HIGH ETCO2</b>	<ul style="list-style-type: none"> <li>• LOW MINUTE VENTILATION</li> <li>• EXHAUSTED CO2 ABSORBENT</li> <li>• PROLAPSED EXPIRATORY VALVE</li> <li>• MALIGNANT HYPERTHERMIA (RARE)</li> </ul>	<ul style="list-style-type: none"> <li>→ INCREASE RESPIRATORY RATE</li> <li>→ CHECK CANISTER INDICATOR + REPLACE PRN</li> <li>→ INSPECT EXP VALVE FOR CONDENSATE, POOR SEATING</li> <li>→ MUST BE CONSIDERED IF NO OTHER EXPLANATION</li> </ul>

# TRAUMA HEMORRHAGE

<p><b>PREPARATION</b></p>	<ul style="list-style-type: none"> <li>· ENSURE HEMORRHAGE CONTROL IS BEING PERFORMED (COMPRESSION, SURGERY)</li> <li>· NOTIFY BLOOD BANK OF MTP NEED</li> <li>· WARM ROOM</li> <li>· ENSURE IV ACCESS: &gt;18G, RIC (8.5Fr), MAC (9Fr)</li> </ul>
<p><b>INITIAL ASSESSMENT OF BLOOD LOSS</b></p>	<ul style="list-style-type: none"> <li>· <b>CLASS I:</b> &lt;15% TBV → EQUAL TO DONATION OF ONE UNIT OF BLOOD)</li> <li>· <b>CLASS II:</b> 15-30% TBV (MILD) → CONSIDER CRYSTALLOID</li> <li>· <b>CLASS III:</b> 31-40% TBV (MODERATE) → CONSIDER BLOOD</li> <li>· <b>CLASS IV:</b> &gt;40% TBV (SEVERE/MORIBOUND) → LIKELY MTP REQUIRED</li> </ul> <p style="text-align: center;"><i>CONSIDER OCCULT HEMORRHAGE (LONG BONE/RETROPERITONEAL, ETC) FOR CLASSES III/IV, HEMODYNAMIC CHANGES WILL BE SIGNIFICANT – HR/RR ↑; BP/UOP/GCS ↓</i></p>
<p><b>INITIAL RESUSCITATION</b></p>	<ul style="list-style-type: none"> <li>· T&amp;C, TYPE O- IF EMERGENT</li> <li>· TRANSFUSE BASED ON CLINICAL SIGNS</li> <li>· SUBSEQUENT VOLUME REPLACEMENT DETERMINED BY PATIENT RESPONSE TO THERAPY</li> </ul>
<p><b>CONSIDER ADJUNCTS</b></p>	<ul style="list-style-type: none"> <li>· TRANEXAMIC ACID (TXA) 1 G WITHIN 3 H OF INJURY (IDEALLY WITHIN 1<sup>st</sup> HOUR)</li> <li>· FOLLOWED WITH TXA INFUSION 1 G OVER 8 H</li> <li>· LABS + THROMBOELASTOMETRY/TEG</li> </ul>
<p><b>SECONDARY SURVEY</b></p>	<ul style="list-style-type: none"> <li>· SOURCE CONTROL</li> <li>· REDRESS + TREAT OCCULT SOURCES/WOUNDS</li> </ul>

# TRAUMA CARDIAC ARREST

## CAUSES OF TRAUMATIC CARDIAC ARREST

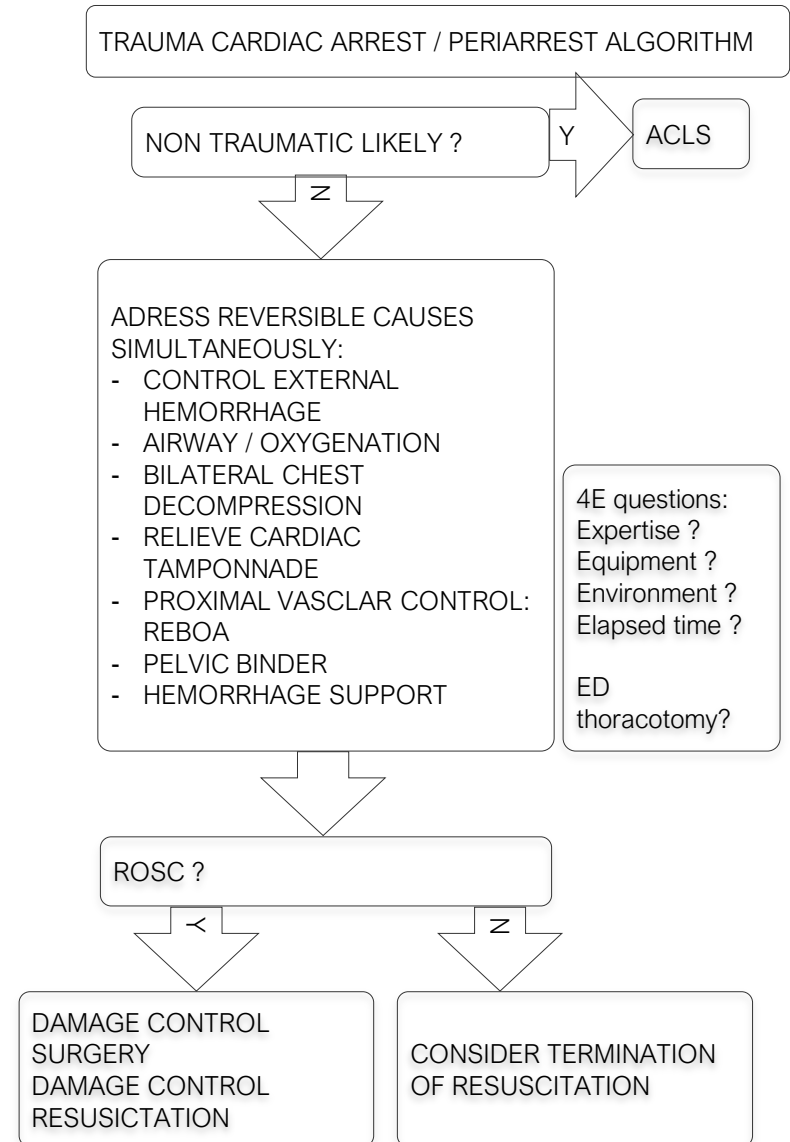
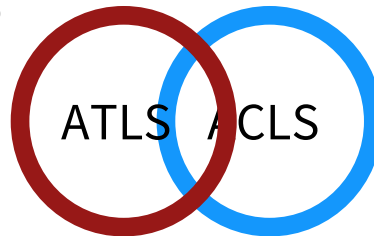
- **HYPOVOLEMIA / BLEEDING: 60%**
- **TENSION PNEUMOTHORAX: 30%**
- **TAMPONNADE: 7%**
- **OBSTRUCTED AIRWAY: 4%**
- **RARE: PRIMARY CARDIAC / ASPHYXIATION / HYPOTHERMIA / COMOTIO CORDIS**

## PROGNOSTICATION

- **BLUNT 6% SURVIVAL**
- **GUNSHOT 8% SURVIVAL**
- **STAB WOUND 20% SURVIVAL**
- **SIGNS OF LIFE ON ADMISSION: ABSENT: 3% SURVIVAL, PRESENT 10%**
- **LOSS OF VITAL SIGNS > 15 MINUTES FOR PENETRATING > 5 MINUTES FOR BLUNT: BAD PROGNOSIS**

## APROACH

- **HYBRID ACLS/ATLS**
- **EXTERNAL CARDIAC MASSAGE USELESS UNLESS HOTT ADDRESSED**
- **EPINEPHRINE 1MG (ACLS) NOT INDICATED**
- **VASOPRESSIN NOT INDICATED**



# NEUROLOGIC TRAUMA - TBI

**OVERALL GOALS: DO NOT DELAY DECOMPRESSION + MAINTAIN CPP/TREAT INCREASED ICP + PREVENT SECONDARY BRAIN INJURY**

<p><b>PRE-OP</b></p>	<ul style="list-style-type: none"> <li>· CLARIFY SURGICAL PLAN             <ul style="list-style-type: none"> <li>- <b>EMERGENCY CRANIOTOMY</b> FOR SUBDURAL, EPIDURAL OR INTRACEREBRAL HEMATOMA</li> <li>- <b>DECOMPRESSIVE CRANIECTOMY</b> FOR ICH REFRACTORY TO MEDICAL TREATMENT</li> <li>- MAY REQUIRE SIMULTANEOUS CRANIOTOMY + LAPAROTOMY</li> </ul> </li> <li>· OBTAIN HISTORY, EXAM, LABS, IMAGING - <b>PARTICULAR ATTENTION TO COAGULATION STATUS</b></li> <li>· ACTIVE TYPE &amp; SCREEN</li> <li>· BE VIGILANT OF OTHER TRAUMA INJURIES (E.G. CERVICAL SPINE)</li> </ul>
<p><b>INTRA-OP</b></p>	<ul style="list-style-type: none"> <li>· MONITORS: STANDARD ASA + ARTERIAL LINE +/- ICP MONITOR/EVD</li> <li>· LARGE BORE IV ACCESS +/- CVC</li> <li>· <b>DO NOT DELAY SURGICAL DECOMPRESSION FOR LINE PLACEMENT</b></li> </ul>
<p><b>INDUCTION + MAINTENANCE</b></p>	<ul style="list-style-type: none"> <li>· <b>ASSUME UNSTABLE C-SPINE AND MANAGE AIRWAY WITH MILS</b></li> <li>· AVOID DEXAMETHASONE</li> <li>· <b>AIM FOR ICP &lt;22 MMHG + CPP 60-70 MM HG (CPP=MAP-ICP)</b></li> <li>· HOB TO 30 DEGREES</li> <li>· MINIMIZE OBSTRUCTION TO VENOUS DRAINAGE FROM HEAD (LOOSEN C-COLLARS, HEAD NEUTRAL, AVOID MULTIPLE CVC)</li> <li>· FLUIDS: ISOTONIC CRYSTALLOIDS (NS, PLASMA-LYTE), <b>AVOID STARCH-BASED COLLOIDS AND LR</b></li> </ul>

## MINIMIZE SECONDARY BRAIN INJURY

- AVOID HYPOTENSION + HYPOXEMIA (PAO<sub>2</sub>>60 MMHG/SAO<sub>2</sub>>90%)
  - **PATIENTS 15- TO 49- OR > 70-YEARS-OLD: SBP ≥110 MMHG**
  - **PATIENTS 50- TO 69-YEARS-OLD: SBP ≥100 MMHG**
- **NORMOCARBIA** (PACO<sub>2</sub> 35-45 MMHG) + **NORMOTHERMIA** (AVOID HYPERTHERMIA) + **NORMOGLYCEMIA** (AVOID HYPOGLYCEMIA)
- MINIMIZE SEIZURES - GIVE PHENYTOIN/FOSPHENYTOIN OR LEVETIRACETAM
  - LOADING DOSES: PHENYTOIN (15 MG/KG OVER 1 HR), FOSPHENYTOIN (15 MG PE/KG AT MAX 150 MG/MIN), LEVETIRACETAM (20 MG/KG OVER 5 MIN)

## MANAGEMENT OF RAISED ICP

- MILD **HYPERVENTILATION** (PACO<sub>2</sub> 26-30 MMHG)
- **MANNITOL** 0.25-1 G/KG OVER 20 MIN
- **HYPERTONIC SALINE** BOLUS
- CSF DRAINAGE 5-10 ML AT 1-2 ML/MIN
- BARBITURATE COMA - PHENOBARBITAL 5-20 MG/KG LOAD + 1-4 MG/KG/HR

# NEUROLOGIC TRAUMA - SPINAL CORD INJURY

**OVERALL GOALS: CONCOMITANT TRAUMA COMMON + CONSIDER NEUROGENIC SHOCK + PREVENT SECONDARY SPINAL CORD INJURY**

<p><b>PRE-OP</b></p>	<ul style="list-style-type: none"> <li>· CLARIFY SURGICAL PLAN - POSITIONING, NEUROMONITORING, EBL</li> <li>· TYPE AND SCREEN</li> <li>· OPTIMIZE PLATELETS/COAGULATION PRIOR TO SURGERY</li> <li>· <b>IF INCOMPLETE INJURY → AIM FOR MAP &gt;85 MMHG WITH PRESSORS PRN</b></li> <li>· <b>SPINAL SHOCK</b> = FLACCID PARALYSIS DISTAL TO INJURY</li> <li>· <b>NEUROGENIC SHOCK</b> = LOSS OF SYMPATHETIC TONE DISTAL TO INJURY → HYPOTENSION, BRADYCARDIA, VASODILATION             <ul style="list-style-type: none"> <li>- MORE COMMON WITH CERVICAL SPINE INJURY</li> <li>- DIAGNOSIS OF EXCLUSION, RULE OUT HEMORRHAGE SHOCK FIRST</li> </ul> </li> </ul>
<p><b>INTRA-OP</b></p>	<ul style="list-style-type: none"> <li>· MONITORS: STANDARD ASA + ART LINE +/- CARDIAC OUTPUT MONITORING</li> <li>· LARGE BORE IV ACCESS X2 +/- CVC IF HIGH VASOPRESSOR REQUIREMENTS</li> <li>· HIGH RISK OF BLEEDING → MANAGE AS PER STANDARD TRAUMA, TXA OK, CELL SAVER OK</li> <li>· CAREFUL POSITIONING OF THE PRONE PATIENT             <ul style="list-style-type: none"> <li>- LOW VENOUS PRESSURE AT SURGICAL SITE</li> <li>- ABDOMINAL PRESSURE → ↓ VENOUS RETURN AND ↑ PRESSURE IN EPIDURAL VENOUS PLEXUS</li> </ul> </li> <li>· IF NEUROMONITORING → NMB REVERSED/USE SUCCINYLCHOLINE + TIVA WITH PROPOFOL AND OPIOID +/- LOW MAC VAPOR</li> </ul>
<p><b>AIRWAY MANAGEMENT</b></p>	<ul style="list-style-type: none"> <li>· MINIMIZE SECONDARY INJURY → KEEP C-SPINE IN NEUTRAL ALIGNMENT, AVOID FLEXION/EXTENSION</li> <li>· REMOVE CERVICAL COLLAR, USE MILS FOR INTUBATION</li> <li>· VL OR FLEXIBLE BRONCHOSCOPY OR CONCOMITANT USE</li> <li>· FIRST PASS SUCCESS IMPORTANT - MOST EXPERIENCED PROVIDER TO MANAGE</li> <li>· INSERT BITE BLOCK AFTER INTUBATION IF MEPS ARE BEING MONITORED</li> <li>· INCREASED RISK OF POST-OP AIRWAY COMPROMISE WITH: ANTERIOR AND POSTERIOR C-SPINE INSTRUMENTATION, PROLONGED SURGERY, LARGE FLUID SHIFTS, FACIAL EDEMA             <ul style="list-style-type: none"> <li>- IF IN DOUBT, KEEP INTUBATED. CONSIDER STEROIDS + CUFF LEAK CHECK PRIOR TO EXTUBATION</li> </ul> </li> </ul>

## PREVENTION OF SECONDARY SPINE INJURY

- AVOID HYPOXIA (PAO2 >60, SAO2 >90%)
- AVOID HYPOTENSION – CLARIFY MAP TARGET WITH SURGEON
- AIM FOR NORMOTHERMIA, AVOID HYPERTHERMIA
- AIM FOR NORMOGLYCEMIA



# ABDOMINAL TRAUMA

<p><b>PREPARATION AND PREOP<sup>1</sup></b></p>	<ul style="list-style-type: none"> <li>· <b>WARMING:</b> KEEP OR WARM (AT LEAST 24 °C (75 °F), UNDERBODY WARMER, FORCED AIR WARMING BLANKET</li> <li>· BLOOD PRODUCTS: <b>MTP ACTIVATED</b>, TXA, CACL2, ABG, POC COAGULATION TESTING, <b>RAPID INFUSER PRIMED AND READY</b>, CELL SAVER IF APPLICABLE/AVAILABLE</li> <li>· ACCESS: CENTRAL, LARGE BORE, ARTERIAL, REBOA<sup>3</sup> + ACCESS SHEATHS</li> </ul>
<p><b>BRIEFING PAUSE</b></p>	<ul style="list-style-type: none"> <li>· IF INDICATED, PELVIC BINDER<sup>2</sup></li> <li>· INJURIES, TREATMENTS RECEIVED SO FAR, NEURO STATUS</li> <li>· ANTIBIOTIC RECEIVED OR DUE</li> <li>· SCD</li> <li>· DAMAGE CONTROL SURGERY - CONTROL BLEEDING AND CONTAMINATION</li> <li>· <b>OUT OF OR IN 2 HOURS</b></li> <li>· <b>MOST LIKELY INJURY TO CAUSE MORTALITY IN NEXT HOUR</b></li> <li>· CELL SAVER SET-UP PRIOR TO OPENING</li> </ul>
<p><b>SOURCE CONTROL</b></p>	<ul style="list-style-type: none"> <li>· CRYSTALLOID &lt;1L TOTAL</li> <li>· TRANSFUSION SUPPORT - 1:1:1 + CRYO/FIBRINOGEN + TXA</li> <li>· CALCIUM FOR IONIZED CA &gt;1.1 OR 1G EVERY 3 PRBC</li> <li>· WARM PATIENT</li> <li>· CONSIDER LOW DOSE VASOPRESSORS</li> <li>· <b>IF PATIENT NEEDS CONTINUED TRANSFUSION SUPPORT AND ABDOMEN DRY → CONSIDER OTHER SOURCES OF BLOOD LOSS</b> (PELVIS, RETROPERITONEUM, LONG BONE)</li> </ul>
<p><b>END OF CASE MANAGEMENT</b></p>	<ul style="list-style-type: none"> <li>· FINAL CHECK OF HEMOSTASIS, CLOSURE BY SENIOR SURGEON</li> <li>· <b>CONSIDER BRAIN + MYOCARDIAL PERFUSION, MAP 80-100 IF TBI</b></li> <li>· TEE MONITORING TO IDENTIFY FILLING ISSUES/MYOCARDIAL DYSFUNCTION</li> <li>· CONTROL HOMEOSTASIS: ABG, CBG, POC COAGS, K, MG</li> <li>· <b>TRANSPORT PREPARATION</b> - DRUGS, VENTILATOR, MONITORS</li> <li>· COMPLETE DOCUMENTATION, DEACTIVATE MTP</li> </ul>

# EXTREMITY TRAUMA

<p><b>GENERAL PRINCIPLES</b></p>	<ul style="list-style-type: none"> <li>· <b>DO NOT UNDERESTIMATE BLOOD LOSSES FROM LONG BONE INJURIES</b> <ul style="list-style-type: none"> <li>- FEMUR 1500 CC</li> <li>- HUMERUS/TIBIA 750 CC</li> </ul> </li> <li>· APPLY TOURNIQUET TO TEMPORARILY CONTROL EXTREMITY BLEEDING</li> <li>· <b>IF PATIENT UNSTABLE → DAMAGE CONTROL (EXTERNAL SPANNING FIXATION)</b></li> <li>· IF VASCULAR RECONSTRUCTION/REIMPLANTATION → LOCAL REGIONAL PRIOR TO HEPARIN FOR SYMPATHECTOMY/BLOOD FLOW</li> </ul>
<p><b>OPEN FRACTURE ANTIBIOTIC PROPHYLAXIS<sup>1</sup></b></p>	<ul style="list-style-type: none"> <li>· GUSTILO III: <ul style="list-style-type: none"> <li>- IIIA = SUFFICIENT SOFT TISSUE FOR COVERAGE</li> <li>- IIIB = REQUIRING FLAP FOR TISSUE COVERAGE</li> <li>- IIIC = ASSOCIATED VASCULAR INJURY</li> </ul> </li> <li>· DURATION OF PROPHYLAXIS: <ul style="list-style-type: none"> <li>- GRADE I/II = 24 HOURS</li> <li>- GRADE III = 24 HOURS AFTER WOUND CLOSURE, MAXIMUM 48 HOURS</li> <li>- GRADE III CONTAMINATED = 48 HOURS AFTER WOUND CLOSURE (FARM INJURIES AUTOMATICALLY IIIA)</li> </ul> </li> <li>· IF KNOWN MRSA → ADD VANCOMYCIN 15 MG/KG Q12H</li> <li>· CONTAMINATION <ul style="list-style-type: none"> <li>- CONSIDER ADDING PENICILLIN INSTEAD OF METRONIDAZOLE</li> <li>- FRESHWATER = FLUOROQUINOLONES, SALTWATER = DOXYCYCLINE</li> </ul> </li> <li>· <b>CONSIDER PERIOPERATIVE REDOSING ANTIBIOTIC DOSING EVERY 4 HOURS OR PER 1500 CC BLOOD LOSS</b></li> <li>· UPDATE TETANUS BOOSTER</li> </ul>
<p><b>COMPARTMENT SYNDROME</b></p>	<ul style="list-style-type: none"> <li>· <b>COMPARTMENT SYNDROME: PAIN (DISPROPORTION WITH INJURY), PAIN ON PASSIVE EXTENSION, HARD TO TOUCH</b> <ul style="list-style-type: none"> <li>- CLASSICAL SIGNS TOO LATE - PARESTHESIA, PULSELESS, PALLOR, PARALYSIS</li> </ul> </li> <li>· COMPARTMENT PRESSURE: <ul style="list-style-type: none"> <li>- NORMAL: &lt;10 MMHG</li> <li>- HIGH RISK: &gt;20 MMHG</li> <li>- <b>COMPARTMENT: &gt;30 MM HG</b></li> </ul> </li> <li>· <b>DELTA PRESSURE = DBP - COMPARTMENT (IF &gt;30 MMHG, THEN PROCEED WITH FASCIOTOMY)</b></li> <li>· CRUSH INJURY: <ul style="list-style-type: none"> <li>- LR 2000 CC BOLUS + 10 CC/KG/HR</li> <li>- BICARB 100 MMOL LOADING + 20-30 MMOL/HOUR</li> <li>- AIM FOR URINE PH &gt;7.0 AND UOP &gt;5 CC/KG/HR</li> </ul> </li> <li>· HYPERKALEMIA: CACL 1G + INHALED B2 MIMETICS + INSULIN 10U/GLUCOSE 25G + RESIN EXCHANGE + HEMODIALYSIS</li> <li>· MANGLED EXTREMITY SEVERITY SCORE<sup>2</sup></li> </ul>

# BURN TRAUMA

<p><b>GENERAL PRINCIPLES<sup>1</sup></b></p>	<ul style="list-style-type: none"> <li>· <b>MOST BURNS ARE SECONDARY TO TRAUMA - INITIAL ASSESSMENT AS PER ATLS</b></li> <li>· BURN SHOCK             <ul style="list-style-type: none"> <li>- VOLUME (TRANSLOCATION, SKIN LOSSES)</li> <li>- PUMP (MYOCARDIAL DEPRESSION)</li> <li>- PERIPHERY</li> </ul> </li> <li>· <b>HYPOTHERMIA</b> - OR TO &gt;30C (&gt;86F), MAX HUMIDITY IN OR, UNDERBODY WARM BLANKET, UNCOVER THE LEAST POSSIBLE SURFACE AREA</li> <li>· <b>BURN DEBRIDEMENT, SKIN GRAFTING ASSOCIATED WITH SIGNIFICANT BLOOD LOSS → PLAN 1 PRBC + 1 FFP PER EACH 1-2% DEBRIDED</b></li> <li>· FLUID MANAGEMENT             <ul style="list-style-type: none"> <li>- TOO LITTLE = END ORGAN FAILURE, AKI</li> <li>- TOO MUCH = FLUID CREEP, MASSIVE EDEMA</li> </ul> </li> </ul>
<p><b>INTUBATION INDICATIONS</b></p>	<ul style="list-style-type: none"> <li>· INHALATIONAL INJURY OR SUSPICION OF</li> <li>· DEEP FACE BURN (DEEP 2ND OR 3RD DEGREE)</li> <li>· NECK CIRCULAR BURN (&gt;75% OF CIRCUMFERENCE)</li> <li>· BURNS &gt;40% TBSA</li> <li>· EXPLOSION WITH BLAST INJURIES</li> <li>· HBCO &gt;10%</li> <li>· CYANIDE POISONING</li> </ul> <p><b>** SUCCINYLCHOLINE OKAY IF &lt;24 HOURS FROM BURN **</b></p>
<p><b>BREATHING</b></p>	<ul style="list-style-type: none"> <li>· CAN HAVE ALL THREE: SMOKE/CO/CYANIDE</li> <li>· SMOKE INHALATION = CLINICAL + BRONCHOSCOPY</li> <li>· <b>CARBON MONOXIDE: DIAGNOSED BY CO-OXIMETRY, SPO2 WILL BE NORMAL</b></li> <li>· CYANIDE: LACTATE &gt;10 MMOL NOT SHOCK, SCVO2 &gt;90%</li> <li>· NORMAL CXR OR OXYGENATION DO NOT EXCLUDE DIAGNOSIS</li> <li>· LUNG PROTECTIVE VENTILATION</li> <li>· <b>AVOID PROPHYLACTIC STEROIDS OR ANTIBIOTICS FOR SMOKE INHALATION</b></li> </ul>
<p><b>CIRCULATION</b></p>	<ul style="list-style-type: none"> <li>· <b>PARKLAND FORMULA FOR BURNS &gt;15%</b> <ul style="list-style-type: none"> <li>- 4 ML/KG BODY WEIGHT X % BURN SURFACE AREA</li> <li>- 50% FIRST 8 HOURS, 50% 8-24 HOURS</li> <li>- END POINT: UOP 0.5-1.0 ML/KG/HR</li> </ul> </li> <li>· CORRECT ELECTROLYTES, MAINTAIN ALBUMIN</li> <li>· SERIAL HB LEVELS</li> <li>· USE ENTERAL SUPPORT FOR BURNS &lt;15%, ADD FREE WATER ENTERAL &lt;24 HOURS</li> </ul>

# OBSTETRIC TRAUMA

<p><b>PRIMARY SURVEY</b></p>	<ul style="list-style-type: none"> <li>· ABCDEFs → <b>PARTURIENT STABILIZATION IS THE FIRST PRIORITY</b></li> <li>· INCREASED RISK OF PROM, PRETERM LABOR, SAB, PLACENTAL ABRUPTION, UTERINE RUPTURE, STILL-BIRTH, C-SECTION IN TRAUMA</li> <li>· ESTABLISH FETAL MONITORING ASAP</li> </ul>
<p><b>IMAGING</b></p>	<ul style="list-style-type: none"> <li>· <b>NEVER WITHHOLD, DELAY OR DEFER IMAGING</b> DUE TO CONCERN FOR FETAL RADIATION EXPOSURE</li> </ul>
<p><b>SECONDARY SURVEY</b></p>	<ul style="list-style-type: none"> <li>· FOCUSED TRAUMA, MEDICAL AND SURGICAL HISTORY</li> <li>· OBSTETRIC HISTORY (GESTATIONAL AGE, PRENATAL CARE, PROBLEMS DURING PREGNANCY)</li> </ul>
<p><b>RESUSCITATION</b></p>	<ul style="list-style-type: none"> <li>· <b>LEFT UTERINE DISPLACEMENT</b></li> <li>· PRODUCTS             <ul style="list-style-type: none"> <li>· IF UNCROSS-MATCHED BLOOD → <b>PREFER TYPE O RH-NEG</b> (AVOID RH SENSITIZATION)</li> <li>· <b>MTP → 1:1:1 + EARLY CRYOPRECIPITATE</b></li> <li>· EARLY GOAL-DIRECTED APPROACH (PT, INR, PTT, FIBRINOGEN, TEG, ROTEM)</li> </ul> </li> <li>· MEDICATIONS             <ul style="list-style-type: none"> <li>· VASOPRESSORS: EPHEDRINE + PHENYLEPHRINE + NOREPINEPHRINE ACCEPTABLE</li> <li>· TXA OKAY</li> </ul> </li> <li>· ACLS             <ul style="list-style-type: none"> <li>· NO CHANGES TO ACLS ALGORITHM, EXCEPT FOR THE NEED OF LEFT UTERINE DISPLACEMENT</li> <li>· HIGH PRIORITY FOR AIRWAY MANAGEMENT</li> <li>· REMOVE FETAL MONITORS DURING ACLS</li> <li>· <b>IF ACLS NOT SUCCESSFUL (NO ROSC WITHIN 4 MIN) → EMERGENCY C-SECTION RECOMMENDED IF &gt;20 WEEKS GESTATION</b></li> </ul> </li> <li>· RHO (D) IMMUNE GLOBULIN (ANTI-D IGG, RHOGAM) SHOULD BE GIVEN TO RH-NEGATIVE PREGNANT WOMEN WITHIN 72 HOURS OF TRAUMA</li> </ul>
<p><b>ANESTHESIA TECHNIQUE</b></p>	<ul style="list-style-type: none"> <li>· IF STABLE → NEURAXIAL PREFERRED</li> <li>· UNSTABLE <b>OR</b> REQUIRE IMMEDIATE SURGERY <b>OR</b> COAGULOPATHY → GENERAL ANESTHESIA</li> </ul>

# PEDIATRIC TRAUMA

<p><b>BACKGROUND + CONSIDERATIONS</b></p>	<ul style="list-style-type: none"> <li>· IF ABLE, TRANSFER TO SPECIALIST CENTERS DUE TO DIFFERENT INJURY PROFILE THAN ADULTS</li> <li>· <b>CONSIDER INJURIES SECONDARY TO ABUSE AND/OR NEGLECT</b></li> <li>· IMMATURE BONES = INJURIES WITHOUT SIGNS OF BONE/RADIOLOGIC DAMAGE</li> <li>· OLDER CHILDREN → SCREEN FOR SUBSTANCE MISUSE. FEMALES → UNDERGO PREGNANCY TEST</li> <li>· INCREASED PHYSIOLOGIC RESERVE → DIFFERENT DISPLACE OF SHOCK. <b>HYPOTENSION = LATE SIGN. BRADYCARDIA = PRETERMINAL</b></li> <li>· HIGH METABOLIC RATE INCREASES RISK OF INSENSIBLE FLUID LOSSES</li> <li>· INFANTS CAN BLEED LARGE BLOOD VOLUMES INTO THEIR CRANIUM (UNFUSED SUTURES)</li> <li>· <b>CARDIAC OUTPUT IS HEART RATE DEPENDENT</b></li> <li>· USE AN <b>AGE-APPROPRIATE SCREENING TOOL FOR PAIN AND GCS</b> + TARGET AGE-APPROPRIATE HR, BP, RR, TV</li> <li>· BLUNT ABDOMINAL TRAUMA IS OFTEN MANAGED NON-OPERATIVELY</li> </ul>
<p><b>PRE-OP</b></p>	<ul style="list-style-type: none"> <li>· <b>USE BROSELOW TAPE TO MEASURE CHILD</b> + USE APPROPRIATE SIZE EQUIPMENT</li> <li>· IV ACCESS OFTEN DIFFICULT → <b>PROCEED WITH IO</b> AFTER TWO FAILED ATTEMPTS (BE MINDFUL OF PAIN, USE LIDOCAINE)</li> <li>· ALL DRUGS CAN BE GIVEN IO. BE MINDFUL OF FLUID VOLUMES. CAN GIVE VIA PRESSURE BAG/PUMP/MANUALLY</li> <li>· USE PRE-OP ANXIOLYSIS WITH DISTRACTIONS/PLAY THERAPY/MEDICATION PRN</li> <li>· <b>FOR SMALLER CHILDREN, USE MICROTUBES FOR BLOOD SAMPLES/TYPE AND SCREEN</b></li> <li>· CALCULATE DRUG DOSAGES ACCORDING TO SIZE/WEIGHT. HAVE EMERGENCY DRUGS AVAILABLE AND APPROPRIATELY DILUTED</li> </ul>
<p><b>INTRA-OP</b></p>	<ul style="list-style-type: none"> <li>· IF APPROPRIATE, ALLOW PARENT/CAREGIVER TO ACCOMPANY CHILD TO OR</li> <li>· TRAUMA AND PAIN INCREASE VOMITING RISK - <b>USE RSI TECHNIQUE</b></li> <li>· EMERGENT PEDIATRIC AIRWAYS HIGH RISK FOR FAILED INTUBATION → <b>VL FIRST LINE + BACK-UP EQUIPMENT+ VERBALIZE PLAN</b></li> <li>· DECOMPRESS STOMACH AFTER INTUBATION WITH OGT</li> <li>· RELATIVELY LARGE SA:VOLUME RATIO → <b>HIGHER RISK OF HYPOTHERMIA</b></li> <li>· FLUID RESUSCITATION = ML/KG. BLOOD PRODUCTS = KG BODY WEIGHT</li> </ul>
<p><b>POST-OP</b></p>	<ul style="list-style-type: none"> <li>· REGIONAL TECHNIQUES + NEURAXIAL BLOCKS EFFECTIVE FOR POST-OP PAIN</li> <li>· CARE SHOULD BE JOINTLY MANAGED WITH PEDIATRIC TEAM IN AN AREA EXPERIENCED WITH PEDIATRIC TRAUMA</li> </ul>

# EXPLOSIVE TRAUMA/BLAST INJURY/CBRNE<sup>1</sup>

<p><b>BACKGROUND + CONSIDERATIONS</b></p>	<ul style="list-style-type: none"> <li>· PRIMARY BLAST ONLY WITH HIGH END EXPLOSIVES. SUPERSONIC WAVE, SHEARING FORCES AT AIR/SOLID INTERFACE             <ul style="list-style-type: none"> <li>- 1. BLAST WAVE 8000 M/S, 2. BLAST WIND 500 M/S, 3. RELEASE WIND (SUCKING VACUUM BACK TO EPICENTRE)</li> </ul> </li> <li>· CONCEPT OF INJURY RADII:             <ul style="list-style-type: none"> <li>- BLAST → THERMAL → FRAGMENTS</li> <li>- FRAGMENTS CAN TRAVEL &gt; 1KM</li> <li>- MORE SEVERE INJURY/DEATH CLOSER TO BOMB BUT MORE PATIENTS OUTER RADIUS AND FASTER TO HOSPITAL (REVERSE TRIAGE)</li> </ul> </li> <li>· BLAST IN CONFINED SPACE OR UNDERGROUND TUNNELS - LARGER RADIUS AND MORE COMPLEX DUE TO REFLECTIONS</li> <li>· FORENSIC/EVIDENCE/CHAIN CONSIDERATION: KEEP FRAGMENTS/TISSUE (SUICIDE BOMBER)/OBJECTS</li> </ul>
<p><b>PRIMARY LUNG BLAST</b></p>	<ul style="list-style-type: none"> <li>· MAY PRESENT UP TO 48 HOURS POST-BLAST → SUSPECT WITH <b>DYSPNEA, COUGH, HEMOPTYSIS, CHEST PAIN</b></li> <li>· CXR WITH BUTTERFLY PATTERN</li> <li>· <b>MANAGE AS PULMONARY CONTUSION</b> + PROTECTIVE VENTILATION</li> <li>· BRONCHOPLEURAL FISTULA FREQUENT. AIR EMBOLISM RARE</li> <li>· PROPHYLACTIC BILATERAL CHEST TUBES PRIOR TO PPV OR AIR TRANSPORT</li> </ul>
<p><b>PRIMARY ABDOMINAL BLAST</b></p>	<ul style="list-style-type: none"> <li>· OFTEN DELAYED PRESENTATION</li> <li>· <b>GAS FILLED STRUCTURE AT RISK</b> (IN PARTICULAR, COLON)</li> <li>· BOWEL SHEARING/CONTUSION/PERFORATION (DELAYED) - BE AWARE OF MISSED/DELAYED DIAGNOSIS</li> <li>· MESENTERIC SHEAR - CLINICAL REPEATED EXAMS, CT POOR AT BEGINNING, LATE SIGNS</li> </ul>
<p><b>PRIMARY BRAIN BLAST</b></p>	<ul style="list-style-type: none"> <li>· FOCAL CONTUSIONS AND HEMATOMA</li> <li>· <b>DIFFUSE AXONAL INJURY</b>, BLAST CONCUSSION</li> </ul>
<p><b>CHEMICAL BIOLOGICAL RADIONUCLEAR CONTAMINATION INJURIES (CBRNE)</b></p>	<ul style="list-style-type: none"> <li>· <b>UNIVERSAL PRECAUTIONS EFFECTIVELY PROTECT AGAINST RADIONUCLEAR SECONDARY CONTAMINATION</b></li> <li>· BLOOD BORNE VIRUS PROPHYLAXIS (SUICIDE BOMBERS AND IMPLANTED FOREIGN BODIES IN VICTIMS)             <ul style="list-style-type: none"> <li>- TEST FOR HIV, HEP B/C AT 0, 1.5, 3 AND 5 MONTHS + TEST BOMBER TISSUE IF AVAILABLE</li> <li>- ACCELERATED HEPATITIS B VACCINATION (DAY 0,7, 21, 365) IF NON-IMMUNE. CONSIDER HEP B IMMUNOGLOBULIN IF BOMBER POSITIVE AND VICTIM NEGATIVE</li> <li>- IF BOMBER HIV+, CONSIDER HIV POST-EXPOSURE PROPHYLAXIS</li> </ul> </li> <li>· DIRTY BOMB: CONVENTIONAL EXPLOSIVE + RADIOISOTOPE             <ul style="list-style-type: none"> <li>- NO NUCLEAR DETONATION BUT RADIONUCLIDES ON VICTIMS AND ENVIRONMENTS</li> <li>- SKIN/WOUNDS DECONTAMINATION</li> <li>- LARGE AREA CONTAMINATION</li> </ul> </li> <li>· FULL CBRNE PPE: RAPID PRIMARY (LMA, ATROPINE, EPINEPHRINE) AND THEN DECONTAMINATE</li> <li>· <b>CABCDE ADAPTED TO CBRNE: C: CATASTROPHIC HEMORRHAGE, A: ANTIDOTES/AIRWAY, B: BREATHING, C: CIRCULATION, D: DECONTAMINATION/DISABILITY, E: EVACUATE</b></li> </ul>

# APPENDIX A: Intra-op Hypoxia

## RECRUITMENT MANEUVER

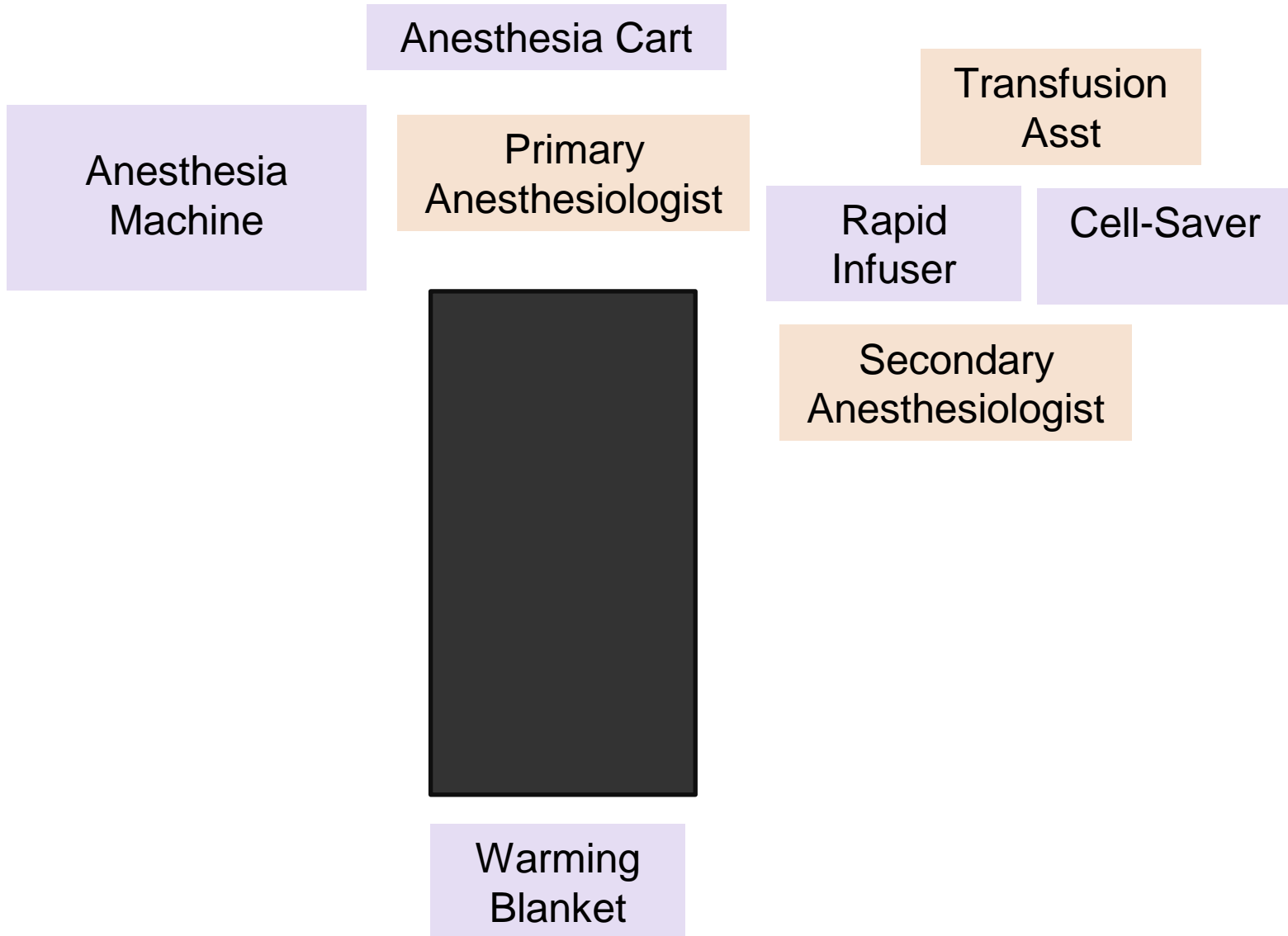
1. APPLY STEPWISE PEEP IN AN ESCALATION/DE-ESCALATION MANEUVER
2. PEEP OF 5 CM H<sub>2</sub>O X3 BREATHS: 10X3 - 15X3 - 20X3 - 15X3 - 10X3
3. ADJUST PEEP TO LEVEL AT WHICH SPO<sub>2</sub> IS OPTIMIZED

INITIALLY SPO<sub>2</sub> MAY DROP AS HEALTHY LUNG TISSUE IS RE-VENTILATED

AVOID “30 OF PEEP FOR 30 SECONDS”

GAS DIRECTED TOWARD HEALTHY LUNG - DOES NOT VENTILATE COLLAPSED ALVEOLI

# APPENDIX B: Trauma OR Set-up





# APPENDIX C: Pelvic Binders

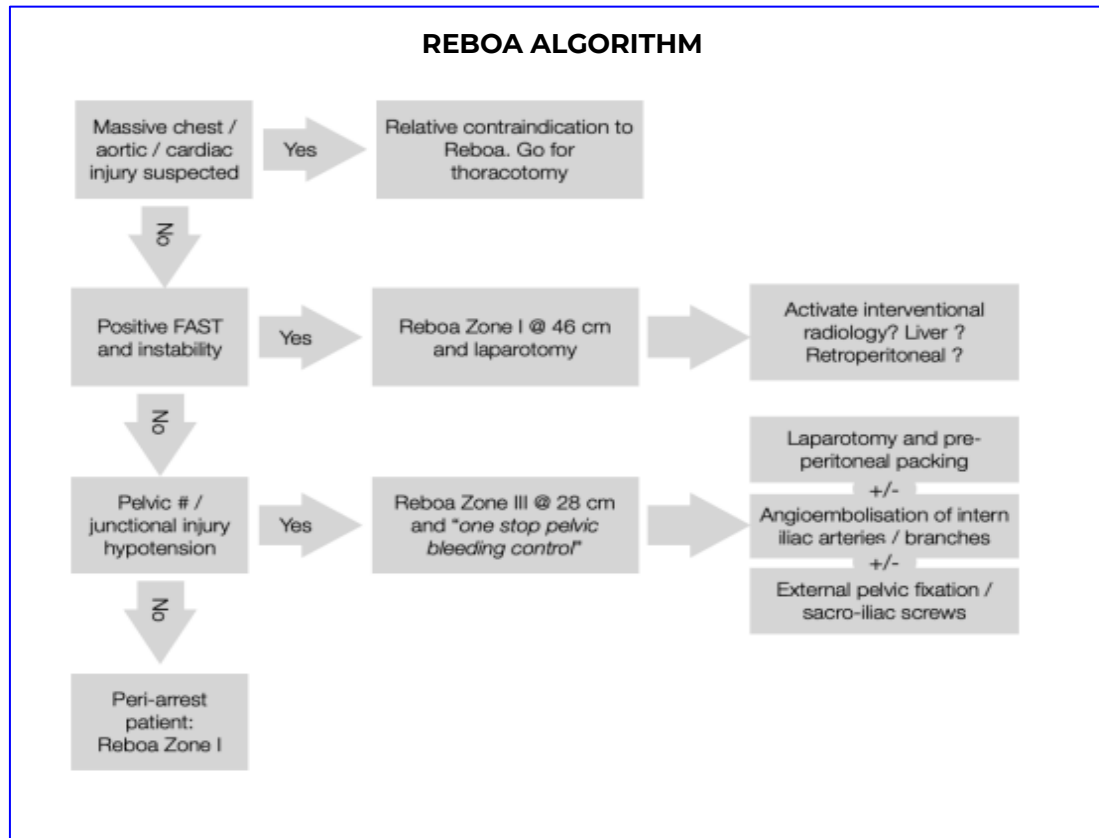
## INDICATIONS FOR PELVIC BINDER

TYPE OF FRACTURE	GRADE	DEFINITION	PELVIC BINDER
AP COMPRESSION	I	PUBIC DIASTASIS <2.5 CM NO SI DISRUPTION	NO
	II	PUBIC DIASTASIS 2.5-4 CM SI DISRUPTION	<b>YES</b>
	III	PUBIC DIASTASIS >4 CM SI DISRUPTION	<b>YES</b>
LATERAL COMPRESSION	I	PUBIC RAMI # SACRAL BUCKLE # SAME SIDE	NO
	II	TYPE I + SI DISRUPTION	<b>YES</b>
	III	TYPE II + CONTRALATERAL INJURY	<b>YES</b>
VERTICAL SHEAR		HEMIPELVIS MOVED UP: RAMI # + SI #	<b>YES</b>

## PELVIC BINDER CONSIDERATIONS

- CENTER ON GREATER TROCHANTERS, UPPER EDGE ON ILIAC CREST. BUCKLE OF PUBIC SYMPHYSIS.
- APC2, APC3 - ASSOCIATED WITH ABDOMINAL INJURIES
- APC3, APC3 AND LC3 - MOST BLOOD LOSS
- HEMATOMA > 500 CC OR 4 CM - 50% ARTERIAL BLEED
- CONSIDER REBOA IF AVAILABLE

# APPENDIX D: REBOA



# APPENDIX E: Open Fractures

## OPEN FRACTURES GRADING AND ANTIBIOPROPHYLAXIS

	DEFINITION	ANTIBIOTIC	SEVERE BETA LACTAM ALLERGY
I	CLEAN WOUND <1 CM	CEFAZOLIN 2G (3G IF >120 KG) Q8H	CLINDAMYCIN 900 MG Q8H
II	CLEAN WOUND 1-10 CM MODERATE TISSUE DESTRUCTION	CEFAZOLIN 2G (3G IF >120 KG) Q8H	CLINDAMYCIN 900 MG Q8H
III	WOUND >10 CM EXTENSIVE SOFT TISSUE DAMAGE OPEN SEGMENTAL # TRAUMATIC CRUSH/AMPUTATION	CEFTRIAXONE 2G Q24H	CLINDAMYCIN 900 MG Q8H <b>AND</b> LEVOFLOXACIN 500 MG Q24H
IV	WITH GROSS SOIL/FECAL CONTAMINATION FARM INJURIES	CEFTRIAXONE 2G Q24H <b>AND</b> METRONIDAZOLE 500 MG Q8H	LEVOFLOXACIN 500 MG Q24H <b>AND</b> METRONIDAZOLE 500 MG Q8H

# APPENDIX F: Mangled Extremities

## MANGLED EXTREMITIES SEVERITY SCORE

AGE	<30 YEARS	0
	30-50 YEARS	1
	>50 YEARS	2
LIMB	REDUCED PULSE, NORMAL PERFUSION	1*
	PULSELESS, CAP REFILL 2"	2*
	COOL, PARALYSIS	3*
SHOCK	SBP >90	0
	TRANSIENT	1
	PERSISTENT	2
INJURY	LOW ENERGY	1
	MEDIUM ENERGY	2
	HIGH ENERGY	3
	VERY HIGH ENERGY	4

\*LIMB POINTS DOUBLED IF >6 HOURS

MESS >7 PREDICTS AMPUTATION

# APPENDIX G: Burn Assessment

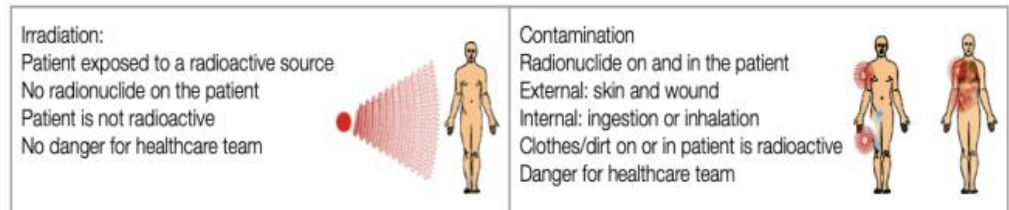
	FIRST DEGREE	SECOND SUPERFICIAL	SECOND DEEP	THIRD DEGREE
<b>ASPECT</b>	RED (SUNBURN)	FLUID FILLED BLISTERS	WHITE/LEATHERY	WHITE OR BROWN
<b>CAP REFILL</b>	PERFUSED	PERFUSED	NOT PERFUSED	THROMBOSED
<b>PAIN</b>	MODERATE PAIN	SEVERE PAIN	NO PAIN	NO PAIN
<b>SENSIBILITY</b>	MODERATE PAIN	VERY PAINFUL	DULL	NO SENSATION
<b>BLEEDING</b>	BLEEDING	BRISK	SLOW BLEEDING	NO BLEEDING
<b>HAIR</b>	ATTACHED	ATTACHED	REMOVABLE	BURNED
<b>HEALING</b>	HEAL AT 48 HOURS	HEAL AT 1 WEEK	REQUIRES SURGERY OR GRAFTING	REQUIRES SURGERY OR GRAFTING

# APPENDIX H: Chemical Injuries

	ONSET	CNS	EYES PUPILS	ORAL SECRETIONS	RESP	CV	SKIN	OTHER	TRIAGE CATEGORY 1	TRIAGE CATEGORY 2	TRIAGE CATEGORY 3	ANTIDOTES TREATMENT
<b>NERVE AGENTS</b>	SEC to HRs	SEIZURES, FASCICULATIONS, FATIGUE/W EAKNESS	PINPOINT, BLURRED VISION	INCREASED	↑RR THEN STOP	↓ HR	SWEATY	VOMITING, INCONTINENCE	UNCONSCIOUS, SEIZURES, RESPIRATORY DISTRESS, PARALYSIS, ARREST, BRADYCARDIA <40 BPM, CYANOSIS	NOT WALKING, SECRETIONS +++, CONFUSION, WHEEZING, VOMITING, DIARRHEA	WALKING, PINPOINT PUPILS, DIMMED VISION, EYE PAIN	ATROPINE 2MG IV BOLUS Q5MIN OR 2 MG BOLUS + INFUSION 0.5-2 MG/HR. OXIMES: PRALIDOXIME 500 MG UP TO 2G Q10-12HR, OBIDOXIME: 220MG THEN 750 MG/24HR CONTINUOUS. ANTICONVULSANTS
<b>BLOOD AGENTS CYANIDE</b>	SEC to MIN	HEADACHE, SEIZURES, COMA	NORMAL TO LARGE		↑RR THEN STOP	↑ HR (REACTIVE)	CHERRY RED THEN BLUE	BRIGHT RED VENOUS BLOOD	RESPIRATORY DISTRESS, UNCONSCIOUS, SEIZURES	CONFUSION, HYPERVENTILATION	WALKING, NAUSEA, VERTIGO	METHB AGENTS: AMYL NITRITE INHALED, SODIUM NITRITE 300 MG OVER 5-10' X2, NATHIOSULFATE 12.5G OVER 5, THEN 6.25 Q15' X2, OR HYDROXYCOBALAMINE 5-10G
<b>CHOKING AGENTS CHLORINE, PHOSGENE, CHLOROPICRIN</b>	MIN to HRs	NO EFFECT		INCREASED	DYSPNEA ARDS		CYANOSIS		RESPIRATORY DISTRESS	NON WALKING, PERSISTENT COUGH, POSSIBLE HEMOPTYSIS	WALKING	NO ANTIDOTES. SUPPORTIVE TREATMENT PHOSGENE PATIENT SHOULD BE OBSERVED FOR 24 HR DUE TO RISK OF DELAYED EFFECTS/SUDDEN DEATH
<b>OPIOIDS</b>	MIN	COMA	PINPOINT	NO EFFECT	↓ RR		CYANOSIS		RESPIRATORY ARREST, UNCONSCIOUS, RESPIRATORY DISTRESS, PULMONARY EDEMA	MILD/MODERATE RESPIRATORY DEPRESSION, AROUSABLE	PINPOINT PUPILS	NALOXONE: IV 0.4 MG Q2' IM: AUTOINJECTOR 2-10 MG Q15', MASSIVE DOSES (20MG) REQUIRED IF HIGH DOSES OPIOIDS OR CARFENTANIL INHALATION
<b>ANTI-CHOLINERGIC</b>	MIN	AGITATION, CONFUSED	MYDRIASIS, BLURRED VISION	DRY MOUTH	↑ RR	↑HR	FLUSHED		UNCONSCIOUS, EXTREME AGITATION OR VIOLENT BEHAVIOR, CONVULSIONS, CHEST PAIN, TEMP >40 C	NOT WALKING, CONFUSION, NOT OBEYING COMMAND, HALLUCINATIONS, TEMP >39 C	WALKING, DRY MOUTH, BLURRED VISION, MILD AGITATION	PHYSOSTIGMINE 1-2 MG IV, REDOSE ½ AT 30 MIN, BENZOS, ACTIVE COOLING
<b>SKIN ARSENIC, HYDROFLUORIC ACID</b>	SEC (HF), MIN to DAYS					HEART FAILURE (CARDIAC SHOCK)		LATE BONE MARROW SUPPRESS	AIRWAY COMPROMISE, RESPIRATORY DISTRESS, HYPOTENSION, SYSTEMIC TOXICITY >25% BSA SULFUR, >5%	NOT WALKING, BSA (SULPHUR MUSTARD 10-25%), AIRWAY IRRITATION, HOARSE VOICE, COUGH, RED PAINFUL EYE	WALKING, ERYTHEMA, EYE PAIN	HF: CALCIUM CHLORIDE IV 1G Q5' TITRATE RAPIDLY. LWSITE: DIMERCAPROL 3 MG/KG IM Q4H X48HR THEN Q12HR X 10 DAYS

# APPENDIX I: Radiological Injuries

- MAY BE DUE TO LOSE RADIATION EXPOSURE DEVICE (SEALED ORPHAN SOURCE), A RADIATION EXPOSURE DEVICE (DIRTY BOMB) OR NUCLEAR DETONATION
- EFFECTS MAY BE IRRADIATION AND/OR CONTAMINATION
- EXPOSURE TO A SEALED SOURCE (RADIATION EXPOSURE DEVICE) LEAD TO IRRADIATION ONLY
- EXPOSURE TO A RADIATION DISPERSING DEVICE (DIRTY BOMB) WILL LEAD TO INTERNAL/EXTERNAL CONTAMINATION AND “CONVENTIONAL” BLAST. TRAUMATIC INJURIES HAVE THE PRIORITY
- CASUALTIES FROM A NUCLEAR DETONATION ARE A COMBINATION OF: IRRADIATION, INTERNAL/WOUNDS AND EXTERNAL ISOTOPE CONTAMINATION, TRAUMA, BLAST AND THERMAL INJURIES. SIGNIFICANT RISK FOR RESPONDERS DUE TO IODINE, CESIUM AND OTHER ISOTOPES FALLOUT.
- PRINCIPLES OF MANAGEMENT OF RADIATION INJURIES:
  - MANAGEMENT OF LIFE THREATENING TRAUMA
  - ASSESSMENT AND DECONTAMINATION OF EXTERNAL, INTERNAL AND WOUND CONTAMINATION
  - ESTIMATION OF ACUTE RADIATION DOSE AND ASSESSMENT OF ACUTE RADIATION SYNDROME
  - TREATMENT OF LOCAL RADIATION BURNS
- EXPOSURE IS THE RESULTANT OF: TIME, DISTANCE FROM SOURCE<sup>2</sup> AND SHIELDING
- ACUTE RADIATION SYNDROME IS DOSE DEPENDENT: HEMATOLOGIC < GASTROINTESTINAL < VASCULAR < NEUROLOGIC
- AFTER 48 HOURS - MEDULLARY APLASIA, BLEEDING, INFECTION SET IN
- WOUNDS DO NOT HEAL BETWEEN DAY 2 AND DAY 90
- ALL TRAUMA SURGERIES NEED TO BE DONE BY 48 HOURS
- DETERMINATION OF DOSE VERY CRITICAL - BASED ON:
  - CLINICAL FEATURES (TIME TO VOMITING)
  - LYMPHOCYTE KINETICS
  - DICENTRIC CHROMOSOMAL ABNORMALITIES



# APPENDIX J

## ACUTE RADIATION SYNDROME AND DOSE IN TOTAL BODY IRRADIATION

	MILD 1-2 GY	MODERATE (2-4 GY) LD5 WITHOUT TREATMENT	SEVERE (4-6 GY) LD5 WITH TREATMENT	VERY SEVERE (6-8 GY) CONSIDER STEM CELL TRANSPLANT	LETHAL >8 GY
<b>VOMITING</b>	>2 HRS 10-50%	1-2 HRS 70-90%	30-60'	10-30'	<10'
<b>DIARRHEA</b>			MILD, 10% ONSET 3-8HR	HEAVY, >10% ONSET 1-3 HR	HEAVY, 100% ONSET <1 HR
<b>NEUROLOGICAL</b>	SLIGHT HEADACHE	MILD HEADACHE	MODERATE HEADACHE ONSET: 4-24 HR INCIDENCE: 50% HAIR LOSS	SEVERE HEADACHE ONSET: 2-4 HR INCIDENCE 80% HAIR LOSS	ONSET WITHIN SECONDS/MINUTE S
<b>TEMPERATURE</b>		INCREASED ONSET: 1-3 HR	FEVER ONSET: 1-2 HR	HIGH FEVER ONSET: <1 HR	HIGH FEVER ONSET: <1 HR
<b>LYMPHOCYTE COUNT AT 24- 48 HR</b>	STABLE	SMALL DROP	<1000	<500 AT 24-48 HR	<500 AT 8-12 HR
<b>FREE INTERVAL TO ORGAN FAILURE</b>		7-15 DAYS	0-7 DAYS	0-2 DAYS	NONE