

WHMC-BAMC ADULT CRITICAL CARE REFERENCE SHEET 2006

ICU QA CHECKLIST (as applicable): Hand-Washing-Infection Control-Universal Precautions? DVT prophylaxis/US screening? GI ulcer prophylaxis? VT 6 ml/kg PBW + Pplat[30[ARDS]? Daily breathing trials [FiO2]0.5, PEEP[8]? Xigris if sepsis+APACHE>25? Monitor platelets on heparin [HIT]? Glucose 80-110? Nutrition? EPO? Spine-cleared? ↑HOB 30-45°? Skin care? Lines-tubes tips+duration? Antibiotic duration? Paralysis/sedation breaks? PT/OT consult? Restraint orders? Advance directive? Transfer planning [intermed care, rehab-SNF]? Social services? Family updated daily?						
IV ANESTHETICS		SINGLE AGENT ANESTHETIC		SEDATION		
	Induction	Maintenance	Loading dose	Maintenance		
		mcg/kg/min	mcg/kg	mcg/kg/min		
Thiopental (Pentothal)	3 - 6 mg/kg (≤ 1 mg/kg elderly, ↓BP)		useful if ↑ICP; caution ↓BP	2000 - 4000		
Propofol (Diprivan)	1.5 - 2.5 mg/kg	100-300	5-10 mg over 10 secs	start 5, ↑ 5 Q 5 min to max 100 (↓BP, ↑TG, ↑kcal, ↓Zn)		
Ketamine (Ketalar)	1- 3mg/kg		useful if hypovolemia or asthma; caution if ↑BP, HR, AML, ↑ICP			
Dexmedetomidine (Precedex)	(avoid CHF or > 24 hrs)		1 mcg/kg ABW over 10 min	0.2-0.7 mcg/kg/h		
Etomidate (Amidate)	0.2 - 0.4 mg/kg		useful if ↓BP; muscle movements blunted by Fentanyl 50 – 100 mcg, ↓adrenal?			
Morphine	1- 3 mg/kg		50 – 200	30 - 150		
Fentanyl	30 -100 mcg/kg	0.1 - 0.3	1 - 5	0.01- 0.03		
SEDATIVES						
Midazolam (Versed)	50 - 200 mcg/kg	0.25 - 1.5	20 - 100	0.25 - 1.0		
Lorazepam (Ativan) [for seizures: 0.1 mg/kg @ 2 mg/min]				1-2 mg IV/IM Q 1-4 h		
Diazepam (Valium)				2 -10 mg IV/IM Q 4-6 h		
Haloperidol (Haldol)	acute delirium: 1 – 5 mg IV; double dose		Q 20 min till calm; give total dose required BID IV or PO	[monitor: QT, V tach, NMS]		
NEUROMUSCULAR BLOCKERS						
	Intubating dose	Typical load	Maintenance	Metabolism		
Succinylcholine (Anectine)	1-1.5 mg/kg	100 mg/70 kg	NR	pseudocholinesterase		
Avoid: ↑K, hemiplegia, guillain-barre, crush (bradycardia with repeat dosing)						
Rocuronium (Zemuron)	0.45 - 0.6 mg/kg	40 mg/70 kg		liver		
Vecuronium (Norcuron)	0.08 - 0.1 mg/kg	7 mg/70 kg (avoid long term)	0.06 - 2 mcg/kg/min	liver		
Cisatracurium (Nimbex)	0.15 - 0.2 mg/kg	10 mg/70 kg (preferred if long term)	2 - 3 mcg/kg/min	Hoffman elimination		
Rapacuronium	1.5 mg/kg	100mg/70 kg (inject over 1 – 5 sec; onset 60 sec, duration 15 min)		infusion not rec		
AUTONOMIC/CARDIOVASCULAR DRUGS						
	IV loading dose	IV Infusion	Dilution	Final		
		(mcg/kg/min)	(in 250 ml)	Conc.		
				Duration		
				Notes		
Phenylephrine	50-100 mcg	0.15 - 0.7	20 mg	80 mcg/ml	5 - 20 min	useful if ↑HR
Norepinephrine (Levophed)	NR	0.05 - 0.5	8 mg	32 mcg/ml	2 - 10 min (phenolamine for extravasation)	
Epinephrine	0.3 - 0.5 mg	0.01 - 0.3	30 mg	120 mcg/ml	5 - 10 min	
Dopamine	NR	5 - 20	400 mg	1600 mcg/ml	< 10 min	
Dobutamine	NR	2 - 30	250 mg	1000 mcg/ml	< 10 min	
Vasopressin (40 units Q 3min X2 for VF,PEA)		0.01-0.04 U/min for refractory shock			< 20-30 min	
Milrinone (Primacor)	50 mcg/kg IV (load, 10 min) ↓ 0.25-0.75 mcg/kg/min (mix 20 mg in 100 ml NS); t _{1/2} 2 hr; renal cleared, ppt with lasix or bumex					
Nesiritide (hBNP, Natrecor)	2 mcg/kg (60 secs) then 0.01 mcg/kg/min infusion X 48 hrs; use: severe CHF; caution: ↓BP (reduce dose 30%)					
Nitroprusside (Nipride)	NR	0.1-10	50 mg	200 mcg/ml	< 10 min	acidosis; thiocyanate levels
Nicardipine	50 ml/hr (5 mg/hr) ↓ increase 25 ml/hr (2.5 mg/hr) Q 5 (max 15 mg/hr – higher OK?)					
Fenoldopam	0.1 mcg/kg/min (↑0.1 mcg/kg/min Q 15 min, max is 1.6 mcg/kg/min) note: D1 agonist, ?renal protective, ↑levels on Tylenol					
Hydralazine	10 mg IV Q 10-15 min (max 50 mg); repeat dose Q 6h; caution: ↑HR, CAD, dissection (useful with B-blocker or clonidine)					
Esmolol (Brevibloc)	0.5 mg/kg 1 min	50 - 300	2.5 g	10 mg/ml	10 - 20 min	
Labetalol (Trandate)	10 mg over 1-2 min (double Q 10 min, max 150 mg)			infusion: 2 – 8 mg/hr	2-4 hr	[IV is 7:1 beta:alpha]
Amiodarone (Cardarone)	150-300mg over 10 min then 1mg/min x6 hr then 0.5mg/min x 18h			50 mg/ml		
Diltiazem (Cardizem)	0.25/0.35 mg/kg	5 -15 mg/hr	125 mg	500 mcg/ml	1-3 hr	
Adenosine	6 mg over 1-3 sec, 20 ml NS bolus – may repeat 12 mg in 1-2 min X2; ↓ effect on theophylline; avoid dipyridamole or wide complex					
THROMBOLYTIC TX (TPA=ALTEPLASE)						
TPA (AMI)	15 mg Bolus ↓ 50 mg over 30 min (0.75 mg/kg) ↓ 35 mg over 60min (0.5 mg/kg) (100 mg Total)					
TPA (PE)	100 mg over 2h	TPA (stroke) 0.9 mg/kg (max 90 mg) over 1h (10% as initial bolus); <3h of sx onset; 6% ICH				TPA (unclog lines or tubes) 2 mg/2 ml
TPA (empyema)	0.1 mg/kg dilute in 50 – 100 ml saline into chest tube, clamp 1 hr, (repeat daily as needed); serial chest CT's					
GASTROINTESTINAL		HEMATOLOGIC			refractory coagulopathy+bleeding (liver, trauma, etc):	
Octreotide	50 mcg IV bolus then 50 mcg/hr X 5d	Procrit (Epo) 600 u/kg (40,000 units) Q week	rFVIIa 80-100 mcg/kg (t1/2 – 2.5 hrs, check PT 1 hr)			
Ranitidine (prevent GIB on MV)	50 mg IV q 8 hr	DDAVP 0.3 mcg/kg IV (for uremic bleeding)				
Carafate (prevent GIB on MV)	1 gm po QID	Estrogen 0.6 mg/kg days 1-5 prior to invasive procedure (for uremic bleeding)				
Omeprazole (bleeding PUD)	40 mg po BID X5d	Protamine 10-50 mg IV over 10 min. (1mg antagonizes 100 units UF heparin or 1 mg LMWH)				
Pantoprazole (bleeding PUD)	80 mg IV ↓ 8 mg/hr X3d	DVT Prophylaxis (serial ultrasound high risk pts)+TEDS, PCDs				
Neostigmine (pseudobstruction)	2 mg IV over 3 mins	Heparin 5000 U SQ BID-TID or Fondaparinux (Arixtra) 2.5mg SQ QD (start >6 h post-op) or				
ENDOCRINE		Enoxaparin (Lovenox) 40mg SQ QD (30 mg if < 45 kg) or 30mg SQ BID (40 mg SC BID if > 150 kg)				
Insulin 0.1U/kg IV bolus ↓ 0.1 U/kg/hr infusion		DVT/ PE Treatment (TPA if shock, severe ↓PaO₂, IR consult for severe DVT+ catheter-based tx)				
HC 50 mg IV Q 6h or 100 +10 mg/hr IV [adrenal shock]		Heparin 80 unit/kg load , then 18 unit/kg/hr infusion to PTT 72-125 (use nomogram) or				
“Relative ↓adrenal”: shock and < 9 ↑with Cosyntropin		Enoxaparin 1mg/kg SQ Q 12hr (max dose 150 mg) (target goal 4 h post- dose: anti-Xa 0.5-1.2 u/ml) or				
Thyrotoxic: “PIPS”-PTU,SSKI,Propranolol,Decadron		Fondaparinux (Arixtra) 7.5 mg SQ QD (5 mg if < 50 kg, 10 mg if > 100 kg)				
Myxedema coma: liothyronine (T ₃) 10-25 mcg IV Q 12 h		HIT Type II tx (monitor platelets on UFH or LMWH) Lepirudin 0.4 mg/kg [max 44 mg] IV bolus ↓ 0.15 mg/kg/hr, [renal dz or Argatroban no bolus, 2] 10 mcg/kg/min IV , aPTT 1.5-2.5 X [check in 2 hr], [liver dz				
Diabetes insipidus: DDAVP 1-2 mcg QD-BID SC or IV						
SEPSIS/SEPTIC SHOCK: Early Sepsis Tx Goals : CVP 8-12 [500 ml Q 30 min], ScvO ₂ > 70%[Hct 30% if ScvO ₂ <70?], MAP 65-90, antibiotics <4hr						
XIGRIS 24 mcg/kg/h IV X 4 d [if Apache ≥25, platelets > 30K, contra: active bleeding, stroke < 3 months, CNS surgery -trauma<2 mo; DC 2 hr prior to invasive proc]						
“REFRACTORY SHOCK” – consider Hydrocortisone, Vasopressin, Epi, IVIg (for TSS), Calcium, Glucagon (latter two especially if on B-blocker or Ca-blocker)						

NEUROLOGY

SEIZURES: thiamine-glucose- lorazepam-phenytoin- phenobarbital-midazolam-propofol (mech vent+continuous EEG monitoring)

Phenytoin 15-20 mg/kg IV load @ 50 mg/min [mix in 0.9NS], then 5 mg/kg IV/PO q 24 hr in 3 divided doses; Corrected level = Phenytoin level / (0.2 x albumin + 0.1)

Phenobarbital 15-20 mg/kg IV load up to 300-800 mg IV at 50-75 mg/min

IVlg 400 mg/kg days 1-5 (Guillain-Barre, Myasthenic Crisis)

Mannitol 0.5-2.0 g/kg of 20% solution over 30-60 min or 12.5-25 g over 5-10 min

Nimodipine 60 mg po Q 4h X 21d (for SAH vasospasm)

Spon ICH: stat neuro consult; ? rFVIIa 80 or 160 mcg/kg IV [if sx<3h, GCS >5, no ASCVD hx; □mortality 11%,p=0.02, ?↑risk MI, ischemic stroke 7% vs 2%,p=0.12]

Ischemic STROKE: TPA 0.9 mg/kg (max 90 mg) over 1h (10% as initial bolus); [if sx<3 h and not improving+minimal CT findings; repeat CT 24h; 6% risk ICH!]

Vasospasm -SAH: "TRIPLE H" TX: Hypervolemia [CVP 10-12, PCWP 12-18], Hemodilution [Hct 30-35%], Hypertension [20% > baseline or systolic 150-200]; contra: cerebral infarct or edema, ↑ICP; caution: pulmonary edema 17%; IR consult [angioplasty?, intra-arterial papaverine?]

NMS: [rigid, dysautonomia, MS]s bromocriptine 2.5 mg po [2.5-5.0 mg po tid], dantrolene 1mg/kg IV continuous push till symptoms resolved [max 10mg/kg; also for MH], ECT?, amantadine? **Lethal Catatonia:** ECT, benzodiazepines

SS [above sx+seizures, myoclonus, reflexes]: cyproheptadine 4-8 mg PO (max 8 mg QID)+benzodiazepine?

TOXICOLOGY

COCAINE: agitation or SVT (lorazepam), seizures (phenobarb), VT (NaHCO₃, Mg), ↑BP (Nipride, NTG, phentolamine)

Glucagon (Ca⁺⁺ or B-blocker OD) 3-10 mg IV bolus □ 2-5 mg/hr [if severe: insulin 0.1-10 u/kg/hr+glucose 10-75g/hr]

Naloxone (Narcan)

0.1-0.4mg IM/IV/SQ q3 min

Flumazenil (Romazicon)

0.2 mg/IV q min up to 1mg max 5 min. or 3 mg max 1 hr

Fomepizole (methanol, EG OD) 15 mg/kg IV load □ 10 mg/kg Q 12 hr X 48hr □ 15 mg/kg Q 12hr (till methanol, EG < 20)

Ethanol (methanol, EG OD) 1g/kg (10 ml/kg) of 10% ethanol (100 mg/ml) IV over 1-2 hr; then 100 mg/kg/hr

Octreotide (sulfonylurea OD) 40-100 mcg SQ Q 6-12 hr X 2-3 days (monitor glucose 24 hr after DC) + D10W

Acetylcysteine (Tylenol OD) 140 mg/kg load of 10-20% solution PO or IV then 70 mg/kg q4h x 17 doses

Methylene blue (MetHb) 1-2 mg/kg over 5 minutes

Activated Charcoal 1 g/kg with sorbitol [ineffective with LMW, Lithium, heavy metals]

CroFab (snake bite)

4-6 vials [repeat 1 hr if severe] □ 2 vials Q 6 hr X 18 hr

Digoxin immune Fab (Digibind)

38mg/vial, # vials = dig level (ng/ml) x wt (kg) / 100 IV over 30 minutes

ACID/BASE FORMULAS

1. Metabolic Acidosis

COMPENSATION
PaCO₂ □ 1.25 mmHg per mEq/L □ HCO₃

RULE OF 80s (last 2 digits pH+PaCO₂):
pH + PaCO₂ = 80 (pure resp disorder)

2. Metabolic Alkalosis

PaCO₂ ↑ 0.75 mmHg per mEq/L □ HCO₃

pH + PaCO₂ < 70 (met acidosis)

3. Respiratory Acidosis (PaCO₂ > 45):

Acute: ↑HCO₃ 1 mEq/L per 10 mm ↑PaCO₂

pH + PaCO₂ > 90 (met alkalosis)

Chronic: ↑HCO₃ 4 mEq/L per 10 mm ↑PaCO₂

4. Respiratory Alkalosis (PaCO₂ < 35):

Acute: ↓HCO₃ 2 mEq/L per 10 mm ↓PaCO₂

Chronic: ↓HCO₃ 4 mEq/L per 10 mm ↓PaCO₂

RENAL FORMULAS:

H₂O gain or loss = 0.6Xkg-0.6Xkg x Na/140

Free H₂O Deficit (L) = 0.6 kg x (Na/140 - 1) 50% over 8 hours then remainder over 16 hours

Potassium Deficit (mEq) = 370 mEq for each 1 mEq fall in serum K □ pH 0.1 □ ↑K 0.6]

HCO₃ deficit (mEq) = 0.5 kg (Desired HCO₃ - measured HCO₃) Replace 50% then recheck

Osmolality (calculated) = 2 Na + (BUN/2.8) + (Glucose/18) + (EtOH level/4.6) normal gap < 10 mOsm [↑glucose 100 □ □Na 1.35]

C_{H2O} = U_{volume} X [(U_{Na} + U_K)/P_{Na}] **Hi-Dose Diuretic:** Lasix 100 mg IV □ 20 mg/h (double Q 12-24 h, max 160 mg/hr; Cl<95) or torsemide 20 mg IV/PO (200 mg/d)

HEMODYNAMIC FORMULAS

CI = *CO/BSA

SV = CO/HR

MAP = DP + 1/3 (SBP - DBP)

SVR = [(MAP - CVP) / CO] x 80

SVRI = [(MAP - CVP)/CI]

PVR = [(MPAP - PAOP)/CO] x 80

PVRI = [(MPAP - PAOP)/CI] x 80

ALVEOLAR OXYGEN TENSION = (P_b - P_{H2O}) F_{IO2} - PaCO₂/0.8

ARTERIAL OXYGEN CONTENT: CaO₂ = (SaO₂) (Hb x 1.34) + PaO₂ (0.0031)

VENOUS OXYGEN CONTENT: CvO₂ = (SvO₂) (Hb x 1.34) + PvO₂ (0.0031)

PHYSIOLOGIC DEAD SPACE (BOHR): Vd/Vt = (PaCO₂ - P_ECO₂)/PaCO₂

FICK EQUATION: CO = VO₂ / (CaO₂ - CvO₂) x 10

OXYGEN CONSUMPTION: VO₂ = CO (CaO₂ - CvO₂) x 10

OXYGEN DELIVERY: DO₂ = CO(CaO₂) x 10

OXYGEN EXTRACTION RATIO: O₂ER = VO₂/DO₂

OXYGENATION INDEX: OI = [(Mean Airway Pressure)(F_{IO2})/PaO₂

CEREBRAL PERFUSION PRESSURE: CPP = MAP - ICP

NUTRITION-METABOLIC CALCULATIONS

Weir Equation: REE = 5.68 VO₂ + 1.59 VCO₂ - 2.17 N₂ Modified Weir: REE = 7 x VO₂ REE(kcal) = 25-30 kcal/kg/d H₂O Maintenance = 30-35 ml/kg/d

CHO = 4 cal/gm, protein = 4 cal/g, fat = 9 cal/g Non-protein kcal ratio = CHO:FAT 60-70:30-40 N₂ Balance = (Total protein intake (g) / 6.25) - (UUN + 4g)

Protein required: 1-1.5 g/kg/d **PBW(kg) Male** = 50 + 2.3 [height (in) - 60] **PBW(kg) Female** = 45.5 + 2.3 [height (in) - 60] **height** = crown-heel or arm span/1.06

MECHANICAL VENTILATION - initial settings [then use ARDS Algorithms for CV, APRV, HFOV]

- (CV) Volume-control (for ARDS) VT ≤ 6 ml/kg PBW, I:E 1:2-1:1, PEEP 10, Pplat □30, RR 15 - 35, Flow triggering 1-3 L/min (see PBW formulas above)
 - (CV) Pressure-control (for ARDS) Ppeak 30-40 (target VT □ 6 mg/kg PBW), I:E 1:2-2:1, PEEP 10, RR 12 - 35
 - APRV/BiLevel (for severe ARDS) P_{hi} 30 □ 35, P_{lo} 0, T_{hi} 4.5, T_{low} 0.8 □ 0.4 (adjust T_{low} to 40% PEFr; monitor VT, V_E autoPEEP), ATC "on", no paralytics **OR**
 - HFOV (3100B if >35kg) mPaw 34, □IP 90, Hz 7 [if pH<7.2] 5 cm H₂O cuff-leak+Hz 6-5-4-3], IT%=33, BF 40 L/min **start if** Pplat >30, P_{hi}>35+ F_{IO2}>70%
 - (CV) Volume-control (for severe COPD, asthma) VT ≤ 6 ml/kg PBW, I:E 1:3-8, no PEEP, Pplat □30 (monitor iPEEP, ΔP_{peak}-P_{plat}), RR □ 12
- Notes: 1. Severe ARDS (P/F < 100, OI > 30) for CV modes may ↑ PEEP to max 24 (but keep Pplat □ 30), may ↑ I:E to 2:1, measure bladder pressure [=abdomen]
- Severe ARDS - consider prone positioning, recruiting maneuvers (CPAP 40-45-50 cm H₂O X 40-60 secs), rarely iNO (5 ppm, daily dose re-titration)
 - Conventional Ventilation: PaCO₂X VT (or V_E or rate) = desired PaCO₂ X new VT (or new V_E or new rate)
 - Weaning: daily breathing trials when F_{IO2} ≤ 50% and PEEP ≤ 8 cm H₂O; consider extubation to BiPAP for appropriate candidates (e.g. COPD)
 - Consider BiPAP or IPV for non-intubated patients with "muscle weakness" [VC<15 ml/kg, MIP<30] prone to atelectasis (e.g. spine, chest wall injury)
 - No HME:** V_E>10, T<32°, ↑thick-copius secretions, prior ETT block, BPF, cuff-leak, frequent MDI or aerosols, difficult triggering -weaning (severe COPD)

