Hackettstown Regional Medical Center

MEDICATION USE POLICY

TITLE: **STANDARD CONCENTRATION AND ADMIXTURE POLICY OF IV DRIPS (ADULT)**		
EFFECTIVE DATE: 11/2005	**POLICY #: PN.03**	**PAGE: 1**
CREATED BY: R. Thelin, PharmD, A. Savite', RN	**Review/Revision: 3/07, 10/07, 7/09, 7/10, 5/11, 11/12,7/13,11/13, 4/15, 7/15, 5/16**	DISTRIBUTION: PHARMACY, NURSING, MEDICAL STAFF

POLICY

1. Standardized concentrations of IV drug admixtures for adult patients at Hackettstown Regional Medical Center are defined within this policy for the drugs listed on the following pages.
2. As per the Hackettstown Regional Medical Center Pharmacy & Therapeutics (P&T) committee approved protocol, the pharmacist will automatically substitute the standard IV product, diluent and concentration for IV medication orders which contain a diluent and/or concentration that differs from the approved standards or is not specified. If the diluent is not specified, the diluent marked in **BOLD** under 'standard concentration' will be utilized.
3. Calculations of IV drug doses to be done by Pharmacist, RN, or Physician only, are based on total amount of fluid in IV bag/bottle after ordered drug/solution as per physician's order has been added.
4. Only infusion tubing may be used, and all drugs in this policy must be administered via an infusion pump. The infusion pump must be programmed with the name of the drug infusing, drug amount, diluent, titration scale (i.e. mcg/kg/min), and weight (if required). Any bag/bottle that has infused for ≥24 hours should be replaced, independent of amount remaining, unless otherwise stated.
5. Titration will follow the guidelines within this policy, unless otherwise ordered by physician. Physicians may add additional hemodynamic parameters to monitor or range to titrate the drug if so ordered. Any drip that is to be infused above the 'definite' rate must have a physician order to do so.
6. Weight-based drips: Dosing will be based on the current (actual) weight at time of ordering, for both titrated (i.e. NORepinephrine) and set-rate (i.e. Integrilin) drips. Daily weight should always be documented, and all pump settings should be verified at the beginning of every shift. Changes in weight on the pump setting are required once there is a **>5%** change in weight from *the original* value.
7. If volume reduction is necessary, the pharmacy may double-concentrate the ordered drip *if possible*. If a non-standard concentration is dispensed from Pharmacy, a label will be affixed to IV, stating 'CAUTION: NON-STANDARD CONCENTRATION.'
8. For titrated drips that have been turned off for ≥4 hours, an order should be obtained from the physician to restart the infusion. Any titrated drips that have been off for ≥24hrs will automatically be discontinued by pharmacy.

PROCEDURE

EQUIPMENT

1. IV solution/medication as prescribed by physician, and label for IV medication
2. Infusion pump & tubing

ACTION

1. Obtain / read physician's order.
2. Weigh patient or obtain preoperative/pretrauma weight through history.
3. Medication preparation:
   a. Obtain ordered medication in standard concentration from pharmacy or ADM
   b. If reconstitution necessary: utilizing aseptic technique, add ordered drug to IV solution as per standardized concentration chart.
4. Verify label on IV bag with order. If prepared outside of pharmacy, label must include:
   • Patient name (**first identifier**) • Date/Time prepared and initials • Name & dose of drug added
   • Second patient identifier (as per hospital policy) • Expiration date/time [if not written, 12 hours from prep date/time]
   • Date/Time of administration initiation, initials, and rate (or titrate)
   FROM ADM (Pyxis): only Date/Time of administration initiation, initials, and rate (or titrate)
5. Set on infusion pump, then document administration including rate in Nurse's notes/flow sheet & MAR.

MEDICATION AHFS CATEGORIES

08:18 ANTIVIRALS
a. Zidovudine (RETROVIR®)

12:12 SYMPATHOMIMETIC (ADRENERGIC)
a. DOBUTamine (DOBUTREX®)
b. DOPamine (INOTROPIN®)
c. EPINephrine (ADRENALINE®)
d. Isoproterenol - ***removed from formulary***
e. Norepinephrine bitartrate (LEVOPHED®)
f. Phenylephrine (NEO-SYNEPHRINE®)

12:20 SKELETAL MUSCLE RELAXANTS
a. Rocuronium (ZEMURON®)
b. Vecuronium (NORCURON®)

20:12.04 ANTICOAGULANTS
a. Argatroban
b. Heparin sodium

24:04.04 ANTIARRHYTHMICS
a. Amiodarone (CORDARONE®)
b. Lidocaine (XYLOCAINE®)
c. Procainamide (PRONESTYL®)

24:04.08 CARDIOTONIC AGENTS
a. Milrinone lactate (PRIMACOR®)

24:08; 24:12 HYPOTENSIVE / VASODILATING
a. Fenoldopam –***removed from formulary***
b. Nitroglycerin (TRIDIL®)
c. Nesiritide- ***removed from formulary***

28:04 GENERAL ANASTHETICS
a. Propofol (DIPRIVAN®)

28:08 ANALGESICS & ANTIPYRETICS
a. Fentanyl citrate (SUBLIMAZE®)
b. Hydromorphone (DILAUDID®)
c. Meperidine – ***removed from formulary***
d. Morphine

28:10 OPIATE ANTAGONISTS
a. Naloxone (NARCAN®)

24:24; 24:28
β-ADRENERGIC/Ca^{2+} CHANNEL BLOCKING AGENTS
a. Diltiazem (CARDIZEM®)
b. Esmolol (BREVIBLOC®)
c. Labetalol (NORMODYNE®)
d. Nicardipine (CARDENE IV®)

28:24 ANXIOLYTICS, SEDATIVES & HYPNOTICS
a. Dexmedetomidine (PRECEDEX®)
b. Lorazepam (ATIVAN®)
c. Midazolam (VERSED®)

40:28 DIURETICS
a. Furosemide (LASIX®)
b. Bumetanide (BUMEX®)

68:20.08 INSULINS
a. Insulin (HUMULIN R®; NOVOLIN R®)

68:28 PITUITARY
a. Vasopressin (PITRESSIN; ADH)

86:16
RESPIRATORY SMOOTH MUSCLE RELAXANTS
a. Aminophylline

92:00 MISCELLANEOUS:
PLATELET-AGGREGATION INHIBITORS
a. Eptifibatide (INTEGRILIN®)

MISCELLANEOUS GI DRUGS
a. Octreotide (SANDOSTATIN®)

NURSING UNITS
Areas listed in 'Nursing Units' will include

CRITICAL CARE----ED, ICCU, Stepdown (PCU), Op.Room (OR, PACU, SDS, MP)
MED/SURG----------3N/3S
OB----------OBLD, OB4S (Post-partum)

-Any certified RN on the listed unit is permitted to run the medication as an IV infusion
-Medications that can not be administered by IV push on certain units, or must be administered by Physician only will be listed as such
[See PN policy PN.01]

Definitions: **BP: Blood Pressure**
HR: Heart Rate
MAP: Mean Arterial Pressure ((SBP+(2*DBP))/3
ECG: Electrocardiogram

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P.	MEDICATION	DILUENT		STANDARD DILUTION	TITRATION
BB	nesiritide (NATRECOR®)	-	-	Removed from formulary	
CC	niCARdipine (CardENE IV®)	**NaCl**	D5W	20mg / 200mL [0.1mg/mL] **PREMIX**	mg/hr
DD	nitroglycerin (TRIDIL®) *non-DEHP*	**D5W**	-	50mg / 250ml [200mcg/ml] **PREMIX**	mcg/min
EE	nitroPRUSSide sodium (NIPRIDE®)	**D5W**	-	50mg / 250ml [200mcg/ml]	mcg/kg/min
FF	norepinephrine (LEVOPHED®)	**D5W**	-	4mg / 250ml [16mcg/mL] Double: 8mg / 250mL [32mcg/mL]	mcg/min
GG	octreotide (SANDOSTATIN®)	**NS**	D5W	500mcg / 100ml [5mcg/ml]	mcg/hr
HH	oxytocin (PITOCIN®) *for induction	**D5LR**	-	30units/500mL [60milliUnits/mL]	mUnits/min
II	pantoprazole (PROTONIX®)	**NS**	-	80mg / 500ml [0.16mg/ml]	8 mg/hr
JJ	phenylephrine (NEO-SYNEPHRINE®)	**NS**	D5W	50mg / 250ml [200mcg/mL] Double: 100mg / 250mL [400mcg/mL]	Mcg/min
KK	procainamide (PRONESTYL®)	**NS**	D5W	1gram / 250ml [4mg/mL]	mg/min
LL	propofol (DIPRIVAN®) emulsion	**-**	-	1000mg / 100ml [10mg/ml] **PREMIX**	mcg/kg/min
MM	rocuronium (ZEMURON®)	**NS**	D5W	250mg / 100mL [2.5mg/mL]	mcg/kg/min
NN	terbutaline (BRETHINE®)	**D5W**	NS	5mg / 500mL [10mcg/mL]	mcg/min
OO	vasopressin (PITRESSIN®)	**NS**	D5W	20units / 250ml [0.08units/mL] (shock) 60units / 250mL [0.24units/mL] (bleed)	Units/min
PP	vecuronium (NORCURON®)	**NS**	D5W	50mg / 100mL [0.5mg/mL]	mcg/kg/min
	zidovudine (RETROVIR®)	**D5W**	NS	400mg / 100mL [4mg/mL]	1 mg/kg/hr

Brand-Generic reference

BRAND	GENERIC	BRAND	GENERIC
ADRENALINE	Epinephrine	MORPHINE	Morphine
AMINOPHYLLINE	Aminophylline	NARCAN	Naloxone
ARGATROBAN	Argatroban	NATRECOR (removed from formulary)	
ATIVAN	Lorazepam	NEO-SYNEPHRINE	Phenylephrine
BRETHINE	Terbutaline	NIPRIDE	Nitroprusside sodium
BREVIBLOC	Esmolol	NORCURON	Vecuronium
BUMEX	Bumetanide	NORMODYNE	Labetalol
CardENE IV	NiCARDipine	PITOCIN	Oxytocin
CARDIZEM	Diltiazem	PITRESSIN	Vasopressin
CORDARONE	Amiodarone	PRECEDEX	Dexmedetomidine
CORLOPAM (removed from formulary)		PRIMACOR	Milrinone lactate
DIPRIVAN	Propofol	PRONESTYL	Procainamide
DOBUTREX	Dobutamine	PROTONIX	Pantoprazole
HEPARIN	Heparin	RETROVIR	Zidovudine
NOVOLIN/ HUMULIN	Insulin, Regular	SANDOSTATIN	Octreotide
INTEGRILIN	Eptifibatide	SUBLIMAZE	Fentanyl citrate
INTROPIN	Dopamine	TRIDIL	Nitroglycerin
ISUPREL (removed from formulary)		VERSED	Midazolam
LASIX	Furosemide	XIGRIS (removed from formulary)	
LEVOPHED	Norepinephrine	XYLOCAINE	Lidocaine
MANNITOL	Mannitol	ZEMURON	Rocuronium

Available Sedation scales:

Modified Ramsay Sedation Scale – Goal is 2-3

MODIFIED RAMSAY SEDATION (MRS) SCALE	
Light Sedation	1 = Anxious and agitated or restless or both
	2 = Cooperative, oriented and tranquil
	3 = Responds to commands only
Deep Sedation	4 = Brisk response to a light glabellar tap or loud auditory stimulus
	5 = Sluggish response to a light glabellar tap or loud auditory stimulus
	6 = No response to a light glabellar tap or auditory stimulus
*Glabellar Tap: Tap the smooth surface between eyebrows (above nose) 2-3 times	

Richmond Agitation Sedation Scale (RASS) * - goal is 0 to -1

Richmond Agitation Sedation Scale (RASS) Score	Term	Description
+4	Combative	Overtly combative, violent, immediate danger to staff
+3	Very agitated	Pulls or removes tube(s) or catheter(s); aggressive
+2	Agitated	Frequent non-purposeful movement, fights ventilator
+1	Restless	Anxious but movements not aggressive vigorous
0	**Alert and calm**	
-1	**Drowsy**	**Not fully alert, but has sustained awakening (eye-opening/eye contact) to *voice* (>10 seconds)**
-2	Light sedation	Briefly awakens with eye contact to *voice* **(<10 seconds)**
-3	Moderate sedation	Movement or eye opening to *voice* **(but no eye contact)**
-4	Deep sedation	No response to voice, but movement or eye opening to *physical* stimulation
-5	Unarousable	No response to *voice or physical* stimulation

Procedure for RASS Assessment

1. Observe patient
   a. Patient is alert, restless, or agitated. **(score 0 to +4)**
2. If not alert, state patient's name and *say* to open eyes and look at speaker.
   b. Patient awakens with sustained eye opening and eye contact. **(score –1)**
   c. Patient awakens with eye opening and eye contact, but not sustained. **(score –2)**
   d. Patient has any movement in response to voice but no eye contact. **(score –3)**
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   e. Patient has any movement to physical stimulation. **(score –4)**
   f. Patient has no response to any stimulation. **(score –5)**

* Sessler CN, Gosnell M, Grap MJ, Brophy GT, O'Neal PV, Keane KA et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. Am J Respir Crit Care Med 2002; 166:1338-1344.
* Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S et al. Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). JAMA 2003; 289:2983-2991.

A. aminophylline

How supplied:	250mg/10mL vial; 500mg/20mL vial [25mg/mL] Equivalent to 80% theophylline (400mg theophylline = 500mg aminophylline)
Action:	Methylxanthine which causes bronchodilation, diuresis, CNS and cardiac stimulation, and gastric acid secretion by blocking phosphodiesterase which increases tissue concentrations of cAMP (cyclic adenine monophosphate) and catecholamine release.
Indications:	Bronchodilator in reversible airway obstruction due to asthma or COPD; increase diaphragmatic contractility.
Standard concentration:	**1000mg in 500mL D5W [2mg/mL]** Also compatible in NS

ADMINISTRATION GUIDELINES

Bolus:	6 mg/kg diluted in 100mL D5W IVPB over 30 minutes. MAX rate 25mg/min
IV Drip: **(after bolus)**	**Initial Infusion:** Smoker: 0.8 mg/kg/hr; Nonsmoker: 0.5 mg/kg/hr Heart Failure: 0.1-0.2 mg/kg/hr
Titration: **(mg/kg/hr)**	{TITRATION ONLY AS PER PHYSICIAN ORDER}. **Discontinuation**: no titration necessary
Maximum dose:	**Definite: NONE** Dependent on theophylline level obtained after ~24hrs of infusion
Monitoring: **[NURSING]**	Parameters: Theophylline level [Therapeutic: 10-20mcg/mL]; monitor HR, RR, 0_2 saturation with initiation and every 4 hours during infusion. Side Effects: Tachycardia, nervousness, nausea/vomiting, gastric irritation, insomnia, tremor, seizure.
NURSING UNITS	**All Units: monitored bed only**
Contraindications	Hypersensitivity to theophylline, ethylenediamine

B. amiodarone

Brand : Cordarone®

How supplied:	150 mg/3 ml, 450mg/9mL vial [50 mg/ml] 150mg/100mL D5W IVPB; 360mg/200mL D5W IV
Action:	Class III antiarrythmic: prolongs action potential and refractory period in myocardial tissue; decreases AV conduction and sinus node function
Indications:	Ventricular fibrillation; Ventricular tachycardia; Atrial fibrillation (unlabeled)
Standard concentration:	LOADING DOSE: 150 mg in 100 ml **D5W =**[1.5 mg/ml] INFUSION: **360mg in 200mL D5W = [1.8 mg/mL] PREMIX** If premix not available: **450mg in 250mL D5W** (non-DEHP[PVC])* = [1.8 mg/ml] *Do not use evacuated glass IV bottles for preparation (buffer may cause precipitation).

ADMINISTRATION GUIDELINES

Bolus:	**NON-CARDIAC ARREST:** **Rapid Load (150 mg/ 100ml D5W):** 150mg IV over *first 10 minutes* (15 mg/min) **CARDIAC ARREST:** (OK to prep in DEHP [PVC] containing syringe or bag) 1. **Bolus: 300 mg IV push** (mix in 20-30mL NS or D5W). 2. **Repeat Bolus (>3 min after 1st bolus): only if pulseless rhythm persists or recurs. 150mg IV push** (mix in 20-30mL NS or D5W)
IV Drip: **(after bolus)**	***In-line filter (0.22 micron) must be used.** *Strongly recommended for infusion to central line. 360 mg over the ***first 6 hours*** (**1 mg/min**) = **33.3 mL/hr** 540 mg over the ***next 18 hours*** (**0.5 mg/min**) = **16.6 mL/hr** **AFTER THE FIRST 24 HOURS:** Continue rate of **0.5 mg/min = 16.6 mL/hr**
Titration: (mg/min)	Follow as above. {TITRATION ONLY AS PER PHYSICIAN ORDER}.
Max dose/rate:	**Definite: 2.2 grams in 24 hours**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring: measure PR, QRS, and QT intervals; monitor for PVCs. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Side Effects: QT prolongation, hypotension, bradycardia; Low magnesium level increases risk of Torsades de Pointes; Monitor intake and output for hypovolemia. May cause pulmonary toxicity, exacerbation of arrhythmia, and rare serious liver injury. Patients may have blue skin or tear discoloration.
NURSING UNITS	**CRITICAL CARE**
Contraindications	Severe sinus-node dysfunction; second- or third-degree atrioventricular block

Conversion to oral therapy: is recommended at earliest possible time.

Amiodarone: Conversion of IV Infusion to Oral Dose	
Duration of IV Infusion	**Oral Dose**
< 1 week	800 – 1600 mg/day
1 – 3 weeks	600 – 800 mg/day
> 3 weeks	400 mg/day

C. argatroban

Use Argatroban Order Form

HIGH RISK

How supplied:	50 mg/ 50 ml NS Premix
Action:	Direct, highly selective thrombin inhibitor; reversibly binds to active thrombin site and inhibits fibrin formation.
Indications:	Prophylaxis/treatment of thrombosis in patients with Heparin-Induced Thrombocytopenia (HIT); Percutaneous Coronory Intervention (PCI)
Standard concentration:	**50 mg in 50 ml NaCl = [1mg/mL] PREMIX** Also compatible in D5W ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	**PCI only**
IV Drip:	**Initial Infusion:** As determined by the provider [see algorithm] **PCI dosing not included in this policy**
Titration: (mcg/kg/min)	Titratation based on aPTT; goal aPTT is 66-103 seconds Obtain first aPTT **2 hours** after starting infusion (AND *after* dosage change), then q24hours *See Table below*
Max dose/rate:	**Recommended: 10mcg/kg/min (thrombosis only)** **Definite: None; based on aPTT or ACT**
Monitoring: [NURSING]	Parameters: monitor aPTT (or ACT in PCI): goal aPTT is 66-103 Side Effects: Bleeding, hemorrhage, chest pain, hypotension, ventricular tachycardia, bradycardia, angina, headache, nausea/vomiting, diarrhea, back pain Note: May elevate INR – if combining with oral anticoagulation (warfarin), argatroban can be discontinued when INR >4; reduce starting dose in hepatic impairment (0.5-1mcg/kg/min)
NURSING UNITS	**All Units**
Contraindications	Uncontrollable active bleeding

C. argatroban

Use Argatroban Order Form HIGH RISK

Titration based on aPTT; goal aPTT is 66-103 seconds
Obtain first aPTT **2 hours** after starting infusion (AND *after* dosage change), then q24hours

No Hepatic Dysfunction

Initial rate: 2mcg/kg/min

aPTT<48: INcrease rate 1 mcg/kg/min.
aPTT 48-65: INcrease rate 0.5 mcg/kg/min.
aPTT 66-103: NO CHANGE- Therapeutic
aPTT 104-122: Decrease 0.4 mcg/kg/min
aPTT 123-200: Decrease 0.6 mcg/kg/min
aPTT >200: Decrease 1 mcg/kg/min.

Moderate Hepatic Dysfuntion

Initial rate 0.5mcg/kg/min
aPTT<48: INcrease rate 0.25 mcg/kg/min.
aPTT 48-65: INcrease rate 0.125 mcg/kg/min.
aPTT 66-103: NO CHANGE- Therapeutic
aPTT 104-122: Decrease 0.1 mcg/kg/min
aPTT 123-200: Decrease 0.15 mcg/kg/min
aPTT >200: Decrease 0.25 mcg/kg/min.

Critical Illness With Multi-Organ Failure

Initial rate 0.2mcg/kg/min:
aPTT<48: INcrease rate 0.1 mcg/kg/min.
aPTT 48-65: INcrease rate 0.05 mcg/kg/min.
aPTT 66-103: NO CHANGE- Therapeutic
aPTT 104-122: Decrease 0.04 mcg/kg/min
aPTT 123-200: Decrease 0.06 mcg/kg/min
aPTT >200: Decrease 0.1 mcg/kg/min.

D. bumetanide

Brand: BUMEX®

How supplied:	1mg/4mL vial; 2.5mg/10mL vial
Action:	Loop diuretic: inhibits reabsorption of sodium and chloride in the ascending loop of Henle and distal renal tubule. Increases excretion of water, sodium, chloride, magnesium, and calcium
Indications:	Edema, CHF, Hypertension
Standard concentration:	**10mg in 100mL NS** = [0.1mg/mL] (Withdraw 40ml from 100mL bag before adding drug. Total volume=100 ml) ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	NONE necessary.
IV Drip:	**Initial Infusion:** 0.25 -0.5 mg/hr
Titration: (mg/hr)	{TITRATION ONLY AS PER PHYSICIAN ORDER}, at **120 minute** intervals for urine output or BP Discontinuation: no titration necessary
Maximum dose:	**Recommended: 1 mg/hr** **Definite: 2 mg/hr for no longer than 2 hours**
Monitoring: [NURSING]	Parameters: BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hr x 2, then q2hr x 2 the every 4 hours. Weigh patient at start of infusion and daily (at least); monitor STRICT intake and output. Watch skin turgor, mucous membranes, and extremities/lungs for edema. Side Effects: Ototoxicity, hypokalemia. Watch all electrolyte values.
NURSING UNITS	**CRITICAL CARE**
Contraindications	Anuria; hypersensitivity to sulfonylureas; severe electrolyte depletion
Note:	*1mg Bumetanide = 40mg Furosemide*

Bumetanide Infusion Rates **10mg /100 ml [0.1 mg/ml]**	
0.25 mg/hr	2.5 mL/hr
0.5 mg/hr	5 mL/hr
0.75 mg/hr	7.5 mL/hr
1 mg/hr	10 mL/hr
1.25 mg/hr	12.5 mL/hr
1.5 mg/hr	15 ml/hr
1.75 mg/hr	17.5 mL/hr
2 mg/hr	20 mL/hr

E. dexmedetomidine

Brand: Precedex®

USE RASS SCALE TO MONITOR FOR SEDATION: Goal is -2 to 0

How supplied:	200 mcg/2 mL vial
Action:	Alpha-2 agonist; sedative anesthetic
Indications:	Sedation of initially intubated and mechanically ventilated patients during treatment in an intensive care setting; sedation prior to and/or during surgical or other procedures of nonintubated patients
Standard concentration:	**200mcg in 50mL NS = [4 mcg/mL]** Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	**NO bolus suggested for intubation/maintenance of sedation in ICU patients** ***Administration in presence of provider:** 1 mcg/kg IV push over 10 minutes. (Administer IV Bolus from diluted IV bag)
IV Drip:	**Initial Infusion**: 0.2 to 0.7 mcg/kg/hr *Not indicated for infusion > 24 hours
Titration: (mcg/kg/hr)	Titrate in **0.1mcg/kg/hr** increments at **30 minute** intervals to adequate sedation (while reducing incidence of hypotension) as per RASS (Richard Agitation Sedation Scale), to a goal of 0 to -1. **Discontinuation:** **It is NOT necessary to discontinue the drug prior to extubation.** **Titrate off if infusion >24 hours to prevent clonidine-like withdrawal symptoms.**
Max dose/rate:	**Recommended: 0.7 mcg/kg/hr** **Definite: 1 mcg/kg/hr (no >24 hours)**
Monitoring: [NURSING]	Physician order must state sedation level. If maximum dosage reached, notify physician and assess need for adjunct therapy (consider addition of benzodiazepine). Parameters: Continuous ECG monitoring Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Monitor sedation level with RASS q1hour x 2, then q2 hours. Side Effects: Monitor for bradycardia and hypotension.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	None

F. diltiazem — Brand: Cardizem®

How supplied:	25 mg/5 ml vial [5 mg/ml]; 100mg powder for reconstitution with ADD-VANTAGE 100mL NS
Action:	Calcium-channel blocker; causes relaxation of coronary vascular smooth muscle and coronary vasodilation
Indications:	Atrial fibrillation; Atrial flutter; PSVT; Hypertension; Angina
Standard concentration:	**100 mg in 100ml NS = [1 mg/mL] ADD-Vantage** Pull plug/stopper to mix drug with diluent

ADMINISTRATION GUIDELINES

Bolus:	**0.25 mg/kg** IV push over 2 minutes. May repeat with **0.35 mg/kg** IV push over 2 minutes after 15 minutes if necessary
IV Drip: (after bolus)	**Initial Infusion:** 2.5 –10 mg/hr
Titration: (mg/hr)	Titrate in **2.5-5 mg/hr** increments at **30 minute** intervals if necessary**;** based on HR, BP, or continuation of afib/flutter **Discontinuation: must titrate off**
Maximum dose:	**Definite: 15 mg/hr** **INFUSIONS >24 Hours NOT RECOMMENDED**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring: measure PR intervals; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hr x 2, then q2hr x 2, then every 4 hours. Side Effects: dysrhythmias, heart block, hypotension, bradycardia
NURSING UNITS	**CRITICAL CARE**
Contraindications	Second- or third-degree atrioventricular block or Sick-Sinus Syndrome (SSS) (unless functioning ventricular pacemaker in place), or recent myocardial infarction and pulmonary congestion

Diltiazem Infusion Rates 100 mg/100 ml [1 mg/ml]	
2.5 mg/hr	2.5 mL/hr
5 mg/hr	5 mL/hr
10 mg/hr	10 mL/hr
15 mg/hr	15 Ml/hr

DILTIAZEM Conversion of IV Infusion to Oral Dose (first dose 3 hours after infusion discontinued)	
2.5 mg/hr IV Infusion	90 mg/day Oral Therapy
5 mg/hr IV Infusion	180 mg/day Oral Therapy
7.5 mg/hr IV Infusion	240 mg/day Oral Therapy
10 mg/hr IV Infusion	360 mg/day Oral Therapy

G. DOBUTamine

Brand: DOBUTrex®

How supplied:	**500 mg in 250 ml D5W* = [2 mg/ml] or [2000 mcg/mL] PREMIX** 250 mg/20 ml vial [12.5 mg/ml]
Action:	β-1adrenergic agonist: increases heart contractility and rate
Indications:	Cardiac decompensation (non-stable heart failure); cardiac stress test; Shock
Standard concentration:	**500mg in 250mL D5W = [2 mg/ml] or [2000 mcg/mL] PREMIX** Also compatible in NS *(250mg in 250mL D5W = [1mg/mL] utilized for Cardiac Stress Testing ONLY)

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	*Strongly recommended for infusion to central line **Initial Infusion:** 2.5 – 10 mcg/kg/min [**AS ORDERED**]
Titration: (mcg/kg/min)	{TITRATION ONLY AS PER PHYSICIAN ORDER} ALWAYS administer as **fixed drip** unless otherwise ordered. **Discontinuation:** no titration necessary unless otherwise ordered.
Max dose/rate:	**Definite: 40 mcg/kg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hr x 2, then q2hr x 2, then every 4 hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: dysrhythmias, PVCs, hypertension, tachycardia. Phlebitis if using peripheral IV site: change site at least every 48 hours or infuse to central line
NURSING UNITS	**CRITICAL CARE**
Contraindications	Hypersensivity to sulfites; idiopathic hypertrophies subaortic stenosis
IV EXTRAVASATION	Dilute phentolamine (Regitine®) 5 mg to 10mL with 0.9% Sodium Chloride. Physician injects into IV catheter and liberally throughout infiltrated area. Monitor site. May require additional injections if blanching should recur.

H. DOPamine

Brand: Intropin®

How supplied:	**400 mg in 250 ml D5W = [1.6 mg/ml] or [1600 mcg/mL] PREMIX** 400 mg/5 mL vial [80 mg/mL]
Action:	Stimulates dopaminergic and adrenergic receptors (β-1, α-1); Hemodynamic effects are dose-dependent.
Indications:	Hemodynamic support(hypotension), renal perfusion
Standard concentration:	**STD: 400mg in 250mL D5W =[1.6 mg/mL] or [1600 mcg/mL] PREMIX** **DOUBLE: 800 mg in 250 ml D5W =[3.2 mg/ml] or [3200mcg/mL]** Also compatible in NS

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	***MUST infuse through CENTRAL line. Peripheral administration should only be utilized in emergent situations, for no longer than 8 hours.*** **Initial Infusion:** 1 – 5 mcg/kg/min **Maintenance Infusion:** hemodynamic effects are dose-dependent: Low dose: 0.5–3 mcg/kg/min = dopaminergic (increased renal blood flow / urine output) Intermediate dose: 3–10 mcg/kg/min = β-1 receptors (increased renal blood flow, heart rate, cardiac contractility and cardiac output) High dose: 10-20mcg/kg/min = α-1 receptors (vasoconstriction & increased blood pressure)
Titration: (mcg/kg/min)	Titrate in **1- 5 mcg/kg/min** increments at **30 minute** intervals if necessary for HR, BP (or MAP) **Discontinuation: must titrate off**
Max dose/rate:	**Recommended: 20 mcg/kg/min** **Definite: 40mcg/kg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: dysrhythmias, PVCs, hypertension, tachycardia. Phlebitis if using peripheral IV site: change site at least every 48 hours or infuse to central line Downward titration recommended if drop in urinary output without additional effect on BP.
NURSING UNITS	**CRITICAL CARE*** ***PCU: only 'fixed' drips – titration only with physician order**
Contraindications	Hypersensitivity to dopamine or sulfites; pheochromocytoma; ventricular fibrillation
IV EXTRAVASATION	Dilute phentolamine (Regitine®) 5 mg to 10mL with 0.9% Sodium Chloride. Physician injects into IV catheter and liberally throughout infiltrated area. Monitor site. May require additional injections if blanching should recur.

J. EPINephrine

Brand: Adrenalin®

How supplied:	1mg/1mL ampule; 30mg/30mL vial [1mg/mL]
Action:	Stimulates α_1, β-1, and β-2 adrenergic receptors to cause cardiac stimulation. Vasopressor effects (α) increase as infusion rate is increased
Indications:	Hypotension, shock refractory to dopamine/dobutamine
Standard concentration:	**4mg in 250mL NS = [16 mcg/mL]** Also Compatible with D5W ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	***MUST infuse through CENTRAL line. Peripheral administration should only be utilized in emergent situations, for no longer than 8 hours.*** **Initial Infusion:** 1–3mcg/min
Titration: (mcg/min)	Titrate in **1mcg/min** increments at **30 minute** intervals if necessary for HR, BP (or MAP) **Discontinuation: must titrate off**
Max dose/rate:	**Definite: 10mcg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Monitor intake and output. Side Effects: dysrhythmias, PVCs, hypertension, tachycardia. Phlebitis if using peripheral IV site: change site at least every 48 hours or infuse to central line
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity to sympathomimetics, narrow angle glaucoma.
IV EXTRAVASATION	Dilute phentolamine (Regitine®) 5 mg to 10mL with 0.9% Sodium Chloride. Physician injects into IV catheter and liberally throughout infiltrated area. Monitor site. May require additional injections if blanching should recur.

EPINephrine Infusion Rates 4 mg/250 ml [16 mcg/mL]	
1 mcg/min	3.75 mL/hr
2 mcg/min	7.5 mL/hr
3 mcg/min	11.25mL/hr
4 mcg/min	15 mL/hr
5 mcg/min	18.75mL/hr
6 mcg/min	22.5 mL/hr
7 mcg/min	26.25mL/hr
8 mcg/min	30 mL/hr
9 mcg/min	33.75mL/hr
10 mcg/min	37.5 mL/hr

K. eptifibatide

Use Eptifibatide order form **Brand: Integrilin®**

How supplied:	20mg/10mL vial [2mg/mL] for IV bolus 75mg/100mL SW vial [0.75mg/mL] PREMIX for IV drip
Action:	Blocks the platelet glycoprotein IIb/IIIa receptor, binding site for fibrinogen, and von Willebrand factor, which reversibly blocks platelet aggregation and prevents thrombosis.
Indications:	Acute coronary syndrome, PCI (percutaneous coronary intervention) w/ or w/out stenting
Standard concentration:	**75mg in 100mL SW = [0.75mg/mL] PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	**180mcg/kg IV (MAX 22.6mg) over 1-2 minutes** [use 20mg/10mL vial] *see chart below* (another bolus may be administered 10 minutes after first only for PCI)
IV Drip: (after bolus)	**Maintenance Infusion:** 2 mcg/kg/min
Titration: (mcg/kg/min)	Unnecessary, except in renal impairment. Reduce to 1mcg/kg/min only if CrCl<50mL/min. **Discontinuation: no titration necessary**
Max dose/rate:	**Definite: 2 mcg/kg/min (MAX 15mg/hr) *1mcg/kg/min if CrCl<50mL/min**
Monitoring: [NURSING]	Parameters: Usually administered concurrently with Heparin, therefore monitor aPTT or ACT as ordered for Heparin. Monitor for signs of excessive/unusual bleeding. Weigh patient at start of infusion and daily. Side Effects: Bleeding, intracranial hemorrhage, stroke, thrombocytopenia.
NURSING UNITS	**CRITICAL CARE**
Contraindications	Active abnormal bleeding, history of CVA within 30 days or history of hemorrhagic stroke; severe uncontrolled hypertension; major surgery within previous 6 weeks, thrombocytopenia.

Eptifibatide BOLUS (from 20mg/10mL vial)
180mcg/kg (max 22.6mg)

Weight (kg)	Weight (lb)	Dose	Volume
37-41	81-91	6.8 mg	3.4 mL
42-46	92-102	8 mg	4 mL
47-53	103-117	9 mg	4.5 mL
54-59	118-130	10 mg	5 mL
60-65	131-143	11.2 mg	5.6 mL
66-71	144-157	12.4 mg	6.2 mL
72-78	158-172	13.6 mg	6.8 mL
79-84	173-185	14.6 mg	7.3 mL
85-90	186-198	15.8 mg	7.9 mL
91-96	199-212	17 mg	8.5 mL
97-103	213-227	18 mg	9 mL
104-109	228-240	19 mg	9.5 mL
110-115	241-253	20.4 mg	10.2 mL
116-121	254-267	21.4 mg	10.7 mL
>121	>267	22.6 mg	11.3 mL

L. esmolol

Brand: Brevibloc®

How supplied:	100mg/10mL vial 2.5gram/250mL NS = [10mg/mL] PREMIX
Action:	β-Blocker; Class II antiarrhythmic. Competitive β-1 receptor antagonist (little effect on β-2)
Indications:	Supraventricular tachycardia (SVT), Intra/Postoperative Tachycardia/ Hypertension
Standard concentration:	**2.5 grams in 250mL NS = [10mg/mL] PREMIX** Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	**0.5 – 1 mg/kg** IV push over 60 seconds. May rebolus with 0.5mg/kg, 4 minutes after starting infusion if response not yet adequate, with corresponding 50mcg/kg/min increase in infusion rate immediately after bolus. **Maximum**: 3 bolus doses.
IV Drip: (after bolus)	**Initial Infusion:** 50-100 mcg/kg/min
Titration: (mcg/kg/min)	Titrate in **50 mcg/kg/min** increments at **4 minute** intervals if necessary for BP, HR or continuation of arrhythmia. (responsiveness of ventricular rate) **Discontinuation: must titrate off.** It is recommended to start an alternative agent within 30 minutes prior to reduction of the esmolol infusion rate by 50%.
Max dose/rate:	**SVT: 200** mcg/kg/min (300mcg/kg/min have been used with no added affect) Max recommended duration: 24 hours. **Intra/Postoperative tachycardia/hypertension: 300** mcg/kg/min
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Notify physician if excessive hypotension (SBP<90) or bradycardia (HR<60)
NURSING UNITS	**CRITICAL CARE*** ***PCU: only for <8 hours (or clinical judgment of RN)**
Contraindications	Sinus bradycardia, heart block greater than first degree, pulmonary edema, cardiogenic shock or uncompensated heart failure

M. fenoldopam **Removed from Formulary November 2013**

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N. fentanyl

Brand: Sublimaze®

USE NUMERIC PAIN SCALE or APPROPRIATE VISUAL ANALOG SCALE to MONITOR PAIN CONTROL

How supplied:	100mcg/2mL ampule [50mcg/mL]; 250mcg/5mL ampule; 2500mcg/50mL vial.
Action:	Opioid analgesic (μ-receptor agonist); inhibits ascending pain pathways
Indications:	Pre/post operative pain control; Severe pain in patients allergic/intolerant to other opioids.
Standard concentration:	**300mcg in 30mL NS PCA =[10mcg/mL] HIGH RISK** [unavailable 4/08] **1000 mcg in 100 ml NS = [10 mcg/ml]** Also compatible in D5W (Withdraw 20ml from 100mL bag before adding 20mL drug. Total volume=100 ml)

ADMINISTRATION GUIDELINES

Bolus:	**25– 50mcg slow** IV push over 3 to 5 minutes *Chest constriction can occur with rapid IV administration of Fentanyl*
IV Drip: (after bolus)	**Initial dose dependent on prior exposure to opiates* **Initial Infusion:** 25-50 mcg/hr
Titration: (mcg/hr)	Titrate in **10-25 mcg/hr** increments at **15-30 minute** intervals if necessary, using the *Pain Management Numeric Pain Scale.* Each patient requires individualized dosing; use lowest effective dose **Discontinuation: must titrate off**
Max dose/rate:	**Recommended: 200 mcg/hr** **Definite: 500mcg/hr**
Monitoring: [NURSING]	Monitor type, location, and intensity of pain before initiation. Upon administration, monitor pain intensity q15minutes x 4 (or continue until stable), then q1hour. Monitor BP, HR, RR (and pulse oximetry) to help assess under/overdosing. PCA: Follow PCA flowsheet.
NURSING UNITS	**CRITICAL CARE;** **Med/Surg: ONLY if allergy to Morphine & Hydromorphone**
Contraindications	Increased intracranial pressure (decreases in MAP may decrease cerebral perfusion)
ANTIDOTE:	Naloxone 0.4mg-2mg IV every 2-3 minutes to reverse respiratory depression. Caution: **Half-life of fentanyl is longer than naloxone – rebound respiratory depression may occur.**

Fentanyl Infusion Rates **1000mcg /100 ml [10 mcg/mL]**	
25 mcg/hr	2.5 mL/hr
50 mcg/hr	5 mL/hr
75 mcg/hr	7.5 mL/hr
100 mcg/hr	10 mL/hr
125 mcg/hr	12.5 mL/hr
150 mcg/hr	15 ml/hr
175 mcg/hr	17.5 mL/hr
200 mcg/hr	20 ml/hr

O. furosemide

Brand name: Lasix®

How supplied:	20mg/2mL vial; 40mg/4mL vial; 100mg/10mL vial
Action:	Loop diuretic: inhibits reabsorption of sodium and chloride in the ascending loop of Henle and distal renal tubule. Increases excretion of water, sodium, chloride, magnesium, and calcium
Indications:	Edema, CHF, Hypertension
Standard concentration:	**100mg in 100mL NS* = [1mg/mL]** Also compatible in D5W (Withdraw 10ml from 100mL bag before adding drug. Total volume= 100 mL) ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	NONE necessary.
IV Drip:	**Initial Infusion: 5-10mg/hr**
Titration: (mg/hr)	{TITRATION ONLY AS PER PHYSICIAN ORDER}, at **120 minute** intervals for urine output or BP Discontinuation: no titration necessary
Max dose/rate:	**Recommended: 40mg/hr** **Definite: 100mg/hr for no longer than 2 hours**
Monitoring: [NURSING]	Parameters: BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily(at least); monitor STRICT intake and output. Watch skin turgor, mucous membranes, and extremities/lungs for edema. Side Effects: Ototoxicity, hypokalemia. Watch all electrolyte values.
NURSING UNITS	**CRITICAL CARE**
Contraindications	Anuria; hypersensitivity to sulfonylureas; severe electrolyte depletion

Furosemide Infusion Rates **100mg /100 ml [1 mg/ml]**	
5 mg/hr	5 mL/hr
10 mg/hr	10 mL/hr
15 mg/hr	15 mL/hr
20 mg/hr	20 mL/hr
25 mg/hr	25 mL/hr
30 mg/hr	30 ml/hr
35 mg/hr	35 mL/hr
40 mg/hr	40 ml/hr

P. heparin sodium

HIGH RISK

How supplied:	1,000 units/mL vial; 1,000 units/mL, 10mL vial; 5,000 units/mL vial; **25,000 units in 250mL 0.45% Sodium Chloride PREMIX**
Action:	Anticoagulant; inactivates activated Factor X, inhibits prothrombin to thrombin conversion
Indications:	Treatment or prophylaxis of coagulation disorders, thrombosis, or embolisms
Standard concentration:	**25,000 units in 250mL 0.45% NaCl =[100units/mL] PREMIX** **(100 unit/hr = 1mL/hr)** Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	**1.** DVT/PE/A-Fib **Weight < 100 kg:** 80 units/kg **2.** DVT/PE/A-Fib **Weight ≥ 100 kg:** 8000 units **3.** Cardiac (ACS or AMI withOUT thrombolytic treatment) **Weight < 83kg**: 60 units/kg **4.** Cardiac (ACS or AMI withOUT thrombolytic treatment) **Weight ≥ 83 kg**: 5000 units **5.** Cardiac (ACS or AMI with thrombolytic treatment) **Weight < 83kg:** 60 units/kg OR Maximum of 4000 units **6.** Cardiac (ACS or AMI with thrombolytic treatment) **Weight ≥ 83 kg:** 4000 units **7.** **During titration:** if aPTT <48: **3000 units** bolus IV push
IV Drip: **(after bolus)**	**Initial rate as outlined in Standing Orders [Weight based & Non-Weight based dosing]** **A. DVT/PE/A-fib** **B. Cardiac (ACS or AMI) without thrombolytic treatment** **C. Cardiac (ACS or AMI) with thrombolytic treatment**
Titration: (units/hr)	Based on **aPTT (activated partial thromboplastin time)** levels (see STANDARD ADJUSTMENT TABLE or by Physician order) **Discontinuation: no titration necessary**
Max dose/rate:	**Recommended Initial:** **Definite: none (based on aPTT)** **DVT/PE/A-fib 1800 units/hr** **Cardiac (ACS or AMI) 1000 units/hr**
Monitoring: [NURSING]	Monitor aPTT 6 hours after initial heparin bolus & 6 hours after any dosage change until two consecutive aPTTs are in the therapeutic range. After two consistent target aPTT's are obtained, aPTT is then rechecked daily. Dose adjustments will ONLY be made based on aPTT results. Also monitor for bleeding and thrombocytopenia (decrease in platelets). Limit IM injections. ***Solution, rate, and dose needs to be double checked by 2 RN's or 1 RN/ 1 LPN. All rate changes also need to be double checked and documented.** .
NURSING UNITS	**CRITICAL CARE, Med/Surg, OB**
Contraindications	Severe thrombocytopenia, uncontrollable active bleeding (except when due to DIC)
ANTIDOTE:	Protamine sulfate IV per PHYSICIAN order (Max rate 5mg/min). Each 1 mg of protamine neutralizes approximately 100 units heparin. *NEVER EXCEED 50 MG PROTAMINE IN ANY 10-MINUTE PERIOD OR 100 MG IN 2 HOURS.*

Intravenous Heparin Administration Tables

HIGH RISK

With each PTT result: STANDARD ADJUSTMENT TABLE

☑ RN to adjust the heparin rate and reorder PTT based on dosing table above.

Orders to be written as follows: Current PTT, Current Rate, Rate Change, New Rate, and Time of next PTT.

☐ A. DVT /PE/ A-FIB

Weight ‹ 100 kg *Use Weight-Based Dosing function on infusion pump*		Weight ≥ 100 kg *Use Non-Weight-Based dosing function on the infusion pump*	
Bolus IV	**Infusion Rate**	**Bolus IV**	**Fixed Infusion Rate**
80 units/kg	**18 units/kg/hour**	**8000 units**	**1800 units/hour**

☐ B. CARDIAC *(ACS or AMI withOUT thromybolytic treatment)*

Weight ‹ 83 kg *Use Weight-Based Dosing function on infusion pump*		Weight ≥ 83 kg *Use Non-Weight-Based dosing function on the infusion pump*	
Bolus IV	**Infusion Rate**	**Bolus IV**	**Fixed Infusion Rate**
60 units/kg	**12 units/kg/hour**	**5000 units**	**1,000 units/hour**

☐ C. CARDIAC *(ACS or AMI with thromybolytic treatment)*

Weight ‹ 83 kg *Use Weight-Based Dosing function on infusion pump*		Weight ≥ 83 kg *Use Non-Weight-Based dosing function on the infusion pump*	
Bolus IV	**Infusion Rate**	**Bolus IV**	**Fixed Infusion Rate**
60 units/kg OR Max 4000 units	**12 units/kg/hour**	**4000 units**	**1,000 units/hour**

Standard Adjustment Table

aPTT (seconds)	Bolus Dose	IV rate change (units/kg/hour)	Bolus Dose	IV rate change (units/hr)
< 48	**3000 units**	INcrease by 3 units/kg/hour	**3000 units**	INcrease by 200 units/hour
48-65	X	INcrease by 1 units/kg/hour	**X**	INcrease by 100 units/hour
66-103	X	Therapeutic - No Change	X	Therapeutic - No Change
104-122	X	DEcrease by 1 units/kg/hour	X	DEcrease by 100 units/hour
123-200	X	DEcrease by 3 units/kg/hour	X	DEcrease by 200 units/hour
> 200	X	DEcrease by 5 units/kg/hour	X	DEcrease by 400 units/hour

Q. hydroMORPHONE

PCA = HIGH RISK

Brand name: Dilaudid®

USE NUMERIC PAIN SCALE or APPROPRIATE VISUAL ANALOG SCALE to MONITOR PAIN CONTROL

How supplied:	2mg/1mL syringe, 40mg/20mL vial
Action:	Opiate analgesic; binds to opiate receptors in CNS to inhibit ascending pain pathways
Indications:	Moderate to severe acute or chronic pain
Standard concentration:	**30mg in 30mL NS PCA = [1mg/mL]** **40mg/100mL NS = [0.4mg/mL]** Also compatible in D5W (Withdraw 20mL from 100mL bag before adding drug. Total Volume=100mL)

ADMINISTRATION GUIDELINES

Bolus:	0.5-1mg IV before start of infusion if needed.
IV Drip: (after bolus)	**Initial dose dependent on prior exposure to opiates* **Initial Infusion**: 0.5-1 mg/hr
Titration: (mg/hr)	Titrate in **0.1 - 0.25mg/hr** increments at **30 minute** intervals if necessary using the *Pain Management Numeric Pain Scale.* Each patient requires individualized dosing; use lowest effective dose **Discontinuation: no titration necessary**
Max dose/rate:	**Recommended: 4mg/hr** **Definite: 10mg/hr**
Monitoring: [NURSING]	Monitor type, location, and intensity of pain before initiation. Upon administration, monitor pain intensity q15minutes x 4 (or continue until stable), then q1hour. Monitor BP, HR, RR (and pulse oximetry) to help assess under/overdosing. PCA: Follow PCA flowsheet.
NURSING UNITS	**CRITICAL CARE;** **Med/Surg, OB: via PCA pump only (if possible); only if allergic to morphine**
Contraindications	Hypersensitivity, addiction (opiate)
ANTIDOTE:	Naloxone 0.4mg-2mg IV every 2-3 minutes to reverse respiratory depression. Caution: **Half-life of hydromorphone is longer than naloxone – rebound respiratory depression may occur.**

Hydromorphone Infusion Rates **40mg/100 ml [0.4 mg/ml]**	
0.5 mg/hr	1.25 mL/hr
1 mg/hr	2.5 mL/hr
1.5 mg/hr	3.75 mL/hr
2 mg/hr	5 mL/hr
2.5 mg/hr	6.25 mL/hr
3 mg/hr	7.5 mL/hr
3.5 mg/hr	8.75 mL/hr
4 mg/hr	10 mL/hr

R. insulin, human regular HIGH RISK

Brand Name: Novolin R

FOLLOW INSULIN INFUSION ORDER FORM FOR PATIENTS IN ICCU

How supplied:	1000units/10mL vial
Action:	Decreases blood glucose, by transport of glucose into cells and the conversion of glucose to glycogen.
Indications:	Hyperglycemia, Diabetic Ketoacidosis (DKA)
Standard concentration:	**100 units in 100mL NS* = [1 unit / mL]** ***Prime, then flush tubing with ~25mL of the insulin solution before administration** (adsorption of insulin to bag and IV tubing) *(Due to adsorption, the actual amount of insulin being administered could be substantially less than the apparent amount. Drip titration is based on effect – do not use this dose to determine SQ dosing once discontinued)*

ADMINISTRATION GUIDELINES

Bolus:	NONE necessary (unless ordered as part of a sliding scale). May administer 2-5 units **IV** prior to initiation of drip if ordered.
IV Drip:	**Initial infusion:** as per insulin infusion order form or per physician order **Maintenance infusion:** dependent on blood glucose levels. Adjust based on ordered infusion rates for glucose ranges.
Titration: (units/hr)	Titrate as ordered at **1 hour** intervals if necessary for blood glucose levels. Follow insulin infusion order form or physician orders for adjustments. **Discontinuation: must titrate off based on blood glucose; start SQ insulin scale 2 hours prior to stopping infusion.**
Max dose/rate:	**Recommended: 10 units/hr** **Definite: dependent on blood glucose**
Monitoring: [NURSING]	Parameters: Accuchecks (blood glucose) **every hour** while on infusion. Monitor carbohydrate intake (feedings, TPN, D5W). If carbohydrate source is discontinued, increase monitoring if necessary (may require discontinuation of drip) Once insulin drip discontinued, assess accuchecks every 2hrs x 2, then per physician order. Side Effects: Monitor all electrolytes (& ABGs for **DKA patients**). May cause shift of potassium (hypokalemia).
NURSING UNITS	**CRITICAL CARE*, OB** ***PCU: only for <8 hours (or clinical judgment of RN)**
Contraindications	Hypersensitivity to protamine

Insulin Infusion Rates IV

100 units/100 ml [1 unit/mL]

Prime, then flush tubing with insulin solution before administration

0.2 units/hr	0.2 mL/hr	3 units/hr	3 mL/hr
0.5 units/hr	0.5 mL/hr	3.5 units/hr	3.5 mL/hr
1 unit/hr	1 mL/hr	4 units/hr	4 mL/hr
1.5 units/hr	1.5 mL/hr	5 units/hr	5 mL/hr
2 units/hr	2 mL/hr	6 units/hr	6 mL/hr
2.5 units/hr	2.5 mL/hr	8 units/hr	8 mL/hr

S. isoproterenol **Removed from Formulary**

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T. labetalol

Brand: Trandate®, Normodyne®

How supplied:	100 mg/ 20mL vial, 200 mg/ 40 ml vial (5 mg/mL)
Action:	Selective α_1-adrenergic and nonselective β-adrenergic receptor blocker
Indications:	Severe hypertension
Standard Concentration:	**Standard: 500 mg in 250 ml D5W = [2 mg/ml]** Also compatible with NS (Withdraw 100ml from 250ml bag before adding drug. Total volume=250 ml) ***[Protect from light: AMBER/DARK OVERWRAP]**** **Emergent/overnight: 200 mg in 100 ml D5W = [2 mg/ml]** (Withdraw 40ml from 100ml bag before adding drug. Total volume=100 ml)

ADMINISTRATION GUIDELINES

Bolus:	20 mg IV push over at least 2 minutes. May repeat with 20 to 80 mg at 10 minute intervals until desired blood pressure is achieved, or until continuous infusion started. **MAX dose of 300 mg IV by bolus**
IV Drip: (after bolus)	**Intitial Infusion:** 1-2 mg/min
Titration: (mg/min)	Titrate in **0.5-1mg/min** increments at **15 minute** intervals if necessary for HR, BP, or arrhythmia response. Discontinuation: must titrate off. Start PO immediately upon discontinuation.
Max dose/rate:	**Definite: MAX rate 6mg/min (no more than 1 hour);**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Notify physician if excessive hypotension (SBP<90) or bradycardia (HR<60) Keep patient supine during and for 3 hours after administration.
NURSING UNITS	**CRITICAL CARE*** ***PCU: only for <8 hours (or clinical judgment of RN)**
Contraindications	Bronchial asthma, overt cardiac failure, heart block greater than 1st degree, cardiogenic shock, severe bradycardia.

Labetalol Infusion Rates [2 mg/ml]	
0.5 mg/min	15 mL/hr
1 mg/min	30 mL/hr
1.5 mg/min	45 mL/hr
2 mg/min	60 ml/hr
2.5 mg/min	75 mL/hr
3 mg/min	90 ml/hr
3.5mg/min	105 mL/hr
4 mg/min	120 ml/hr

U. lidocaine

Brand: Xylocaine®

How supplied:	100mg/5mL syringe; 2grams in 500mL D5W **PREMIX**
Action:	Class Ib antiarrhythmic; suppresses initiation and conduction of nerve impulses by increasing electrical stimulation threshold of ventricle (reducing neuronal permeability of sodium). Causes conduction blockade by inhibition of depolarization.
Indications:	Ventricular tachyarrhythmias
Standard concentration:	**2 grams in 500 ml D5W = [4 mg/ml] PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	1 – 1.5mg/kg IV, may repeat doses of 0.5 – 0.75 mg/kg every 5 – 10 minutes to desired effect, up to a total of 3 mg/kg. Do not exceed 200 – 300 mg in 1 hour
IV Drip: **(after bolus)**	**Initial infusion:** With return of perfusion, start infusion at 1 to 4 mg/min. (If arrhythmias occur during an infusion, bolus with 0.5 mg/kg) **Maintenance infusion:** 1 – 4 mg/min
Titration: (mg/min)	Titrate in **1 mg/min** increments at **30 minute** intervals if necessary to suppression of arrhythmia. **Discontinuation**: no titration necessary
Max dose/rate:	**Definite: 4 mg/min**.
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring: measure PR, QRS, and QT intervals; monitor for PVCs. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hr x 2, then q2hr x2, then every 4 hours. Side Effects. Monitor mental status. Patient can become confused, have blurred or double vision. Monitor for tremors or twitching.
NURSING UNITS	**CRITICAL CARE*** ***PCU: only 'fixed' drips – titration only per physician order**
Contraindications	Hypersensitivity to amides, severe heart block, Wolff-Parkinson-White Syndrome.

Lidocaine Infusion Rates 2 gm/500 ml [4 mg/ml]	
1 mg/min	15 ml/hr
2 mg/min	30 ml/hr
3 mg/min	45 ml/hr
4 mg/min	60 ml/hr

V. LORazepam — Brand: Ativan®

USE RASS SCALE TO MONITOR FOR SEDATION: Goal is -2 to 0

How supplied:	2mg/mL syringe; 20 mg/10 ml vial (2 mg/ml)
Action:	Short-acting benzodiazepine central nervous system depressant; Sedative/hypnotic; Binds to postsynaptic GABA receptors, inhibiting neuronal excitability
Indications:	Anxiety, hypnotic, sedation, sedation in mechanically ventilated patients
Standard concentration:	**40 mg in 100 ml D5W (non-DEHP)* =[0.4 mg/ml]** Also compatible in NS ***In-line filter (0.22 micron) must be used.** ***(higher chance of precipitation in NS)***

ADMINISTRATION GUIDELINES

Bolus:	**1 – 2 mg IV push;** May repeat bolus at 10 to 15 minute intervals as needed during titration
IV Drip: (after bolus)	**Initial Infusion:** 1 – 2 mg/hr **Maintenance Infusion:** 1 – 10 mg/hr
Titration: (mg/hr)	Titrate in **0.5-1 mg/hr** increments at **30 minute** intervals until adequate sedation as per RASS (Richard Agitation Sedation Scale), to a goal of 0 to -1. **Discontinuation: must titrate off**
Max dose/rate:	**Recommended: 10mg/hr** **Definite: 15 mg/hr** (propylene glycol diluent=renal toxicity)
Monitoring: [NURSING]	Physician order must state sedation level. IV drip used for sedation in intubated patients. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Monitor RASS q1hour x 2, then q2 hours. Propylene glycol toxicity may occur with high-dose infusions ≥ 48 hours
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity to benzodiazepines, Pregnancy 2nd and 3rd trimesters.
Antidote:	Flumazenil (Romazicon®) 0.2 mg IV over 1 min. May repeat q1min up to a total of 1mg. May repeat same course in 20 minutes . No more than 3 mg should be given in one hour. CAUTION: re-sedation may occur; reverses CNS depression, but not respiratory depression

Lorazepam Infusion Rates (40 mg/ 100 ml)

1 mg/hr	2.5 ml/hr	9 mg/hr	22.5 ml/hr
2 mg/hr	5 ml/hr	10 mg/hr	25 ml/hr
3 mg/hr	7.5 ml/hr	11 mg/hr	27.5ml/hr
4 mg/hr	10 ml/hr	12 mg/hr	30 ml/hr
5 mg/hr	12.5 ml/hr	13 mg/hr	32.5 ml/hr
6 mg/hr	15 ml/hr	14 mg/hr	35 ml/hr
7 mg/hr	17.5 ml/hr	15 mg/hr	37.5 ml/hr
8 mg/hr	20 ml/hr		

W. magnesium* *(for preeclampsia/eclampsia)

HIGH RISK

How supplied:	4 grams in 100mL SW IV [40 mg/mL] PREMIX 20 grams in 500 ml SW IV [40 mg/ml] PREMIX
Action:	Depressant of smooth, skeletal, and cardiac muscle.
Indications:	Prevention and control of eclampsia; uterine tetany; tocolysis
Standard concentration:	**4 grams in 100mL SW = [40 mg/mL] PREMIX** **20 grams in 500 ml SW = [40 mg/mL] PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	4 grams in 100mL SW IV over 20-30 minutes
IV Drip: (after bolus)	**Initial infusion:** 1-2 grams/hr
Titration: (gram/hr)	Titrate in **0.5-1gram/hr** increments, based on Magnesium levels (PHYSICIAN ORDER) Magnesium levels (mg/dL): [1.8-3]: Normal; [4.8-8]: Therapeutic; [>10]: Loss of DTRs [>12]: Respiratory arrest; Cardiac arrest; Paralysis **Discontinuation**: no titration necessary
Max dose/rate:	**Recommended: 3 grams/hr** **Definite: based on Magnesium levels**
Monitoring: [NURSING]	Parameters: Vital signs (BP, HR, RR), Neuro status, ECG recommended, DTR (deep tendon reflexes) every 15min during bolus, then every 30 min x 4, then q60min during maintenance; Magnesium levels (usually every 6 hours, then at least daily); Electronic fetal monitoring; urinary output. Side Effects: Heart block, flushing, hypotension, hypothermia, CNS depression, flaccid paralysis, circulatory collapse, cardiac arrest.
NURSING UNITS	**CRITICAL CARE, OB**
Contraindications	Presence of heart block or myocardial damage
Overdose	Mg concentrations [5 to 10 mEq/L] (2.5 to 5 mmol/L), the ECG shows prolongation of the PR interval, widening of the QRS complex, and increased T-wave amplitude. Deep tendon reflexes disappear as the plasma Mg level approaches [10 mEq/L] (5.0 mmol/L); hypotension, respiratory depression, and narcosis develop with increasing hypermagnesemia. Cardiac arrest may occur when blood Mg levels exceed 12 to 15 mEq/L (6.0 to 7.5 mmol/L)
Overdose Treatment	**IV administration of Calcium Gluconate** 10%, 1gram (10mL) over 5 minutes, repeated as necessary (usually up to 20mL may need to be administered) may reverse many of the Mg-induced cardiac changes, and also respiratory depression. **Administration of IV furosemide** can increase Mg excretion if renal function is adequate and volume status is maintained. Hemodialysis may be valuable in severe hypermagnesemia although a relatively large fraction (about 70%) of blood Mg is ultrafilterable.

X. midazolam

Brand: Versed®

USE RASS SCALE TO MONITOR FOR SEDATION: Goal is -2 to 0

How supplied:	1mg/mL, 2mL and 5mL vials; 50 mg/10 ml vial [5 mg/ml]
Action:	Short-acting benzodiazepine central nervous system depressant; Sedative/hypnotic; Binds to postsynaptic GABA receptors, inhibiting neuronal excitability.
Indications:	Hypnotic, sedation, sedation in mechanically ventilated patients
Standard concentration:	**100 mg in 100 ml NS = [1 mg/ml]** Also Compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	**1-2 mg IV push** ; May repeat bolus at 10 to 15 minute intervals as needed during titration
IV Drip: (after bolus)	**Initial infusion:** 1 – 2 mg/hr **Maintenance infusion:** 1 – 10 mg/hr
Titration: (mg/hr)	Titrate in **0.5-1 mg/hr** increments at **30 minute** intervals until adequate sedation as per RASS (Richard Agitation Sedation Scale), to a goal of 0 to -1. **Discontinuation: must titrate off**
Max dose/rate:	**Recommended: 15 mg/hr** **Definite: 20mg/hr**
Monitoring: [NURSING]	Physician order must state sedation level. IV drip used for sedation in intubated patients. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), q1hr x 2, then q2hr. Monitor sedation level with RASS score q1hr x 2, then q2hr.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Pregnancy, hypersensitivity to benzodiazepines, alcohol intoxication.
Antidote:	Flumazenil (Romazicon®) 0.2 mg IV over 1 min. May repeat q1min up to a total of 1mg. May repeat same course in 20 minutes . No more than 3 mg should be given in one hour. CAUTION: re-sedation may occur; reverses CNS depression, but not respiratory depression

Midazolam Infusion Rates
50mg/50mL or 100mg/100mL [1mg/ml]

1 mg/hr	1 ml/hr	9 mg/hr	9 ml/hr
2 mg/hr	2 ml/hr	10 mg/hr	10 ml/hr
3 mg/hr	3 ml/hr	11 mg/hr	11 ml/hr
4 mg/hr	4 ml/hr	12 mg/hr	12 ml/hr
5 mg/hr	5 ml/hr	13 mg/hr	13 ml/hr
6 mg/hr	6 ml/hr	14 mg/hr	14 ml/hr
7 mg/hr	7 ml/hr	15 mg/hr	15 ml/hr
8 mg/hr	8 ml/hr		

Y. milrinone

Brand: Primacor®

How supplied:	20 mg in 100 ml D5W [200 mcg/ml] PREMIX
Action:	Positive inotropic agent, increases contractility of cardiac muscle with vasodilator properties. Decreases preload and afterload by direct relaxation on vascular smooth muscle.
Indications:	Short term management of advanced CHF that has not responded to other medication.
Standard concentration:	**20 mg in 100 ml D5W = [200 mcg/ml] PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	**50mcg/kg** IV over 10 minutes if ordered. (Administer IV Bolus from diluted IV bag)
IV Drip: (after bolus)	**Maintenance Infusion:** (standard unless specified): Standard dose: 0.5 mcg/kg/min; (Minimum dose: 0.375 mcg/kg/min; Maximum dose: 0.75 mcg/kg/min) Renal impairment: based on standard dose, for CrCl (see table below)
Titration: (mcg/kg/min)	{ONLY PER PHYSICIAN ORDER}. Reduce in renal impairment **Discontinuation: no titration necessary**
Max dose/rate:	**Definite: MAX total dose 1.13 mg/kg/24 hours (including boluses).**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: dysrhythmias, PVCs, hypotension. Monitor electrolytes (hypokalemia)
NURSING UNITS	**CRITICAL CARE: only 'fixed' drips –titration only per physician order**
Contraindications	Hypersensitivity to this drug, severe aortic disease, severe pulmonic valvular disease, acute myocardial infarction.

Milrinone Infusion Rates
(RENAL DOSE ADJUSTMENTS)
[BASED ON STANDARD DOSE]

CrCl	Rate
50mL/min	0.43 mcg/kg/min
40mL/min	0.38 mcg/kg/min
30mL/min	0.33 mcg/kg/min
20mL/min	0.28 mcg/kg/min
10mL/min	0.23 mcg/kg/min
5mL/min	0.2 mcg/kg/min

z. morphine sulfate

PCA = HIGH RISK

USE NUMERIC PAIN SCALE or APPROPRIATE VISUAL ANALOG SCALE to MONITOR PAIN CONTROL

How supplied:	2mg/mL, 4mg/mL, 10mg/mL, 100 mg/4 ml, 30mg/30mL PCA
Action:	Opiate analgesic; binds to opiate receptors in CNS to inhibit ascending pain pathways
Indications:	Moderate to severe acute or chronic pain
Standard concentration:	**30mg in 30mL NS PCA = [1mg/mL]** **100 mg in 100 ml NS = [1 mg/ml]** Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	1 – 5 mg slow IV push
IV Drip: **(after bolus)**	**Initial dose dependent on prior exposure to opiates* **Initial Infusion:** 2 – 4 mg/hr **Maintenance Infusion:** 1 – 10 mg/hr
Titration: (mg/hr)	Titrate in **0.5-1 mg/hr** increments at **30 minute** intervals if necessary using the *Pain Management Numeric Pain Scale.* Each patient requires individualized dosing; use lowest effective dose **Discontinuation: no titration necessary**
Max dose/rate:	**Recommended: 20mg/hr** **Definite: 40mg/hr**
Monitoring: [NURSING]	Monitor type, location, and intensity of pain before initiation. Upon administration, monitor pain intensity q15minutes x 4 (or continue until stable), then q1hour. Monitor BP, HR, RR (and pulse oximetry) to help assess under/overdosing. PCA: Follow PCA flowsheet.
NURSING UNITS	**CRITICAL CARE;** **Med/Surg, OB: via PCA pump only (if possible)**
Contraindications	Hypersensitivity, addiction (opiate), increased ICP.
ANTIDOTE:	Naloxone 0.4mg-2mg IV every 2-3 minutes to reverse respiratory depression. Caution: Half-life of morphine is longer than naloxone – rebound respiratory depression may occur.

Morphine Infusion Rates 100 mg/100 ml [1mg/ml]	
1 mg/hr	1 ml/hr
2 mg/hr	2 ml/hr
3 mg/hr	3 ml/hr
4 mg/hr	4 ml/hr
5 mg/hr	5 ml/hr
6 mg/hr	6 ml/hr
7 mg/hr	7 ml/hr
8 mg/hr	8 ml/hr
9 mg/hr	9 ml/hr
10 mg/hr	10 ml/hr

AA. naloxone

Brand: Narcan®

How supplied:	0.4mg/mL, 4mg/10mL
Action:	Pure opioid antagonist that competes and displaces narcotics at opioid receptor sites
Indications:	Narcotic overdose, reversal of respiratory depression, itching, or nausea
Standard concentration:	**0.4mg in 250mL NS = [1.6 mcg/mL] –**for itching/nausea during opiate infusion **2mg in 250mL NS = [8 mcg/mL] -**overdose only Also compatible in D5W ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus: (overdose only)	0.1-0.4mg IV over 15 seconds; repeat every 2-3 minutes if necessary*. *After patient has received a total of 2mg, consider other causes of respiratory depression
IV Drip: (after bolus for overdose only)	**[0.4mg/250mL]:** no bolus, run at 21mL/hr **[2mg/250mL]: Initial Infusion:** 0.4-2mg/hr Only after continued IV bolus administration [≥2mg] or patient on long acting opioid. Start if RR <8/min, unarousable to tactile stimulation
Titration: (mg/hr) [2mg/250mL drip]	Titrate in **0.4mg/hr** increments at **15 minute** intervals if necessary; titrate to respiratory rate/ level of consciousness. Each patient requires individualized dosing. **Discontinuation: must titrate off** (reduce risk of rebound effect of opiate)
Max dose/rate:	**Recommended: 10mg total**
Monitoring: [NURSING]	Monitor: BP, HR, RR (and pulse oximetry) to assess for continued effects of the opiate and opiate withdrawal. Level of consciousness. Monitor type, location, and intensity of pain before initiation (reversal of effects of opioid) Reconsider the diagnosis if the patient fails to respond after 10mg total.
NURSING UNITS	**0.4mg/250mL: All Units – no titration (21mL/hr)** **2mg/250mL: CRITICAL CARE**
Contraindications	Reversal of nausea or vomiting from opioids or seizures from meperidine. Caution in patients with severe opiate addiction (withdrawal precipitation)

Naloxone Infusion Rate 2mg / 250mL [8mcg/mL]	
0.4mg/hr	50 ml/hr
0.8mg/hr	100 ml/hr
1.2mg/hr	150 ml/hr
1.6 mg/hr	200 ml/hr
2.0 mg/hr	250 ml/hr

BB. **nesiritide** **Removed from Formulary**

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CC. niCARDipine

Brand: CardENE IV®

How supplied:	25mg/10mL ampule, 20mg/200mL NS PREMIX (Also compatible in D5W)
Action:	Calcium channel blocker (2nd generation, I.V. dihydropyridine). Prevents calcium ions from entering cardiac and vascular smooth muscle cells, thus preventing the vascular smooth muscle from contracting. The drug, which is more selective for vascular muscle cells, causes arteries to dilate (relax) and blood pressure to decrease.
Indications:	Short-term treatment of hypertension (when oral therapy is not appropriate)
Standard concentration:	**20mg in 200mL NS = [0.1 mg/mL]** **PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	NONE necessary.
IV Drip:	**Initial infusion**: 2.5-5 mg/hr
Titration: (mg/hr)	Titrate in **2.5 mg/hr** increments at **15 minute** intervals if necessary, based on blood pressure. **Discontinuation: must titrate off**
Max dose/rate:	**Definite: 15mg/hr.**
Monitoring: [NURSING]	Parameters: BP, HR, Rhythm, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), q30min x 1 hour, q1hr x 2, q2hr x 2, then every 4 hours. Weigh patient at start of infusion and daily (at least); monitor STRICT intake and output. Side Effects: Notify physician of headache (14.6%), tachycardia, nausea/vomiting, or excessive hypotension (SBP <90).
NURSING UNITS	**CRITICAL CARE**
Contraindications	Hypersensitivity, advanced aortic stenosis (secondary to reduced afterload: reduction of diastolic pressure in these patients may worsen rather than improve myocardial oxygen balance).

NiCARDIPINE Conversion of Oral dose to IV Infusion	
20mg q8h	0.5 mg/hr IV Infusion
30mg q8h	1.2 mg/hr IV Infusion
40mg q8h	2.2 mg/hr IV Infusion

NiCARDipine IV Infusion Rates [0.1 mg/ml]	
2.5 mg/hr	25 mL/hr
5 mg/hr	50 mL/hr
10 mg/hr	100 mL/hr
15 mg/hr	150 mL/hr

DD. nitroGLYCERIN

Brand: Tridil®

How supplied:	50mg / 250ml D5W bottle [0.2 mg/ml] **PREMIX**
Action:	Vasodilatory effect on peripheral veins (and to a lesser extent, arteries) by smooth muscle relaxation. Reduces cardiac oxygen demand (decreases preload)
Indications:	Hypertension, Angina (CAD), Heart Failure
Standard concentration:	**50 mg in 250 ml D5W bottle = [0.2 mg/mL] PREMIX**

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	**Initial infusion:** 5-10 mcg/min **Maintenance dose:** Range 5 – 200 mcg/min Maximize doses in heart failure if BP tolerates.
Titration: (mcg/min)	Titrate in **5 mcg/min** increments at **5-10 minute** intervals. If no response at 20 mcg/min, increases of 10 mcg/min may be used. Titrate to relief of chest pain, patient tolerance, or specific BP specified by physician. **Discontinuation: must titrate off**
Max dose/rate:	**Definite: 200 mcg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1h x 2, then q2h x2, then q4h. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Notify physician if excessive hypotension (SBP<90) or bradycardia (HR<60), no relief of chest pain, or continued dyspnea.
NURSING UNITS	**CRITICAL CARE*** ***PCU: titration for chest pain only up to 40mcg/min. Notify physician if chest pain persists – anticipate transfer to ICU.**
Contraindications	Allergy to organic nitrates; concomitant administration of phosphodiesterase-5 (PDE-5) inhibitors (sildenafil, tadalafil, vardenafil) – severe hypotension; head trauma or cerebral hemorrhage (increased intracranial pressure); severe anemia; uncorrected hypovolemia; constrictive pericarditis or pericardial tamponade

NitroGLYCERIN Infusion Rate 50 mg/250 ml D5W [0.2 mg/ml]	
5 mcg/min	1.5 ml/hr
10 mcg/min	3 ml/hr
15 mcg/min	4.5 ml/hr
20 mcg/min	6 ml/hr
30 mcg/min	9 ml/hr
40 mcg/min	12 ml/hr
50 mcg/min	15 ml/hr
60 mcg/min	18 ml/hr
70 mcg/min	21 ml/hr
80 mcg/min	24 ml/hr
90 mcg/min	27 ml/hr
100 mcg/min	30 ml/hr
200 mcg/min	60 mL/hr

EE. nitroPRUSSIDE sodium

Brand: Nipride®

How supplied:	50 mg/2 ml vial (25 mg/ml)
Action:	Relaxation of vascular smooth muscle and consequent dilatation of peripheral veins (and to a lesser extent, arteries). (Not as selective for venous dilation as Nitroglycerin). Reduces left-ventricular end-diastolic pressure (LVEDP) and pulmonary capillary wedge pressure (PCWP: preload). Also reduces systemic vascular resistance (SVR), and mean arterial pressure (MAP: afterload)
Indications:	Severe acute hypertension; Pulmonary hypertension
Standard concentration:	**50mg in 250 ml D5W**(only) = **[200 mcg/ml]** *protect from light ****[Protect from light: AMBER/DARK OVERWRAP]*to prevent CYANIDE formation***

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	**Initial Infusion:** 0.3 – 0.5 mcg/kg/min **Maintenance Dose:** Range 0.5 – 5 mcg/kg/min (average dose: 3 mcg/kg/min)
Titration: (mcg/kg/min)	Titrate in **0.5 mcg/kg/min** increments at **15 minute** intervals if necessary for BP. **Discontinuation: must titrate off**
Max dose/rate:	**Definite: 10 mcg/kg/min** INFUSIONS AT MAX DOSE (10 mcg/kg/min) SHOULD NOT EXCEED 10 MINUTES
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Arterial line monitoring recommended. Side Effects: Notify physician if excessive hypotension (SBP<90) or bradycardia (HR<60). Monitor thyocyanate levels in patients with infusions >48 hours, especially at rates >4mcg/kg/min for ≥ 2 hours, and patients with renal or hepatic impairment. [Toxic thiocyanate level: >30mcg/mL; toxic cyanide level: >2 mcg/mL]
NURSING UNITS	**CRITICAL CARE [NOT PCU]**
Contraindications	Compensatory hypertension (aortic coarctation or arteriovenous shunting); Inadequate cerebral circulation; congenital (Leber's) optic atrophy or tobacco amblyopia (high cyanide/thiocyanate ratios); Acute CHF, if reduced peripheral vascular resistance
NITROPRUSSIDE -INDUCED CYANIDE TOXICITY: Kit available in ER or Pharmacy	**Must obtain MD Order for Cyanide Antidote Kit; Follow 3 Step Process:** **(a) Amyl Nitrite Inhalants, 0.3 ml each** Crush perles in gauze and inhale contents (hold in front of patient's mouth/nose) for 15 seconds, then take away for 15 seconds. Continue to repeat 15 second inhalations until IV Sodium Nitrite is administered. Use a new inhalant every three minutes **(b) Sodium Nitrite (3% solution) 300 mg in 10 ml** Adult dose: 300 mg (10 ml) IV over 2 – 4 minutes **(c)Sodium Thiosulfate (25% solution) 12.5 Gm in 50 ml** Adult dose:12.5 Gm (50 ml) slow IV over ≥10 minutes ******If signs of toxicity reappear, may repeat after 2 hours using half of original dose***

FF. NORepinephrine

Brand: Levophed®

How Supplied:	4 mg/4 ml vial (1 mg/ml)
Action:	Stimulates β-1 and α-1 adrenergic receptors, (α-1 > β-1) increasing heart rate and contractility. Increases vasoconstriction and thereby increasing systemic blood pressure & coronary blood flow
Indications:	Acute Severe Hypotension; Shock
Standard concentration:	**Std: 4 mg in 250 ml D5W** (only) **= [16 mcg/ml]** **Double Strength: 8 mg in 250 ml D5W** (only) **= [32 mcg/ml]** ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	***MUST infuse through CENTRAL line. Peripheral administration should only be utilized in emergent situations, for no longer than 8 hours.*** **Initial Infusion:** 8 – 12 mcg/min **Maintenance Infusion:** 2 – 4 mcg/min
Titration: (mcg/min)	Titrate in **1-2 mcg/min** increments at **15 minute** intervals for HR or BP. **Discontinuation: must titrate off**
Max dose/rate:	**Definite: 30 mcg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Peripheral ischemia, dysrhythmias, PVCs, hypertension, tachycardia.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypotension from blood volume deficit; Mesenteric or peripheral vascular thrombosis
IV EXTRAVASATION	Dilute phentolamine (Regitine®) 5 mg to 10mL with 0.9% Sodium Chloride. Physician injects into IV catheter and liberally throughout infiltrated area. Monitor site. May require additional injections if blanching should recur.

NORepinephrine Infusion Rates
STANDARD: 4 mg/250 ml D5W [16 mcg/ml]

1 mcg/min	3.75 mL/hr	11 mcg/min	41.25 mL/hr
2 mcg/min	7.5 mL/hr	12 mcg/min	45 mL/hr
3 mcg/min	11.25 mL/hr	13 mcg/min	48.75 mL/hr
4 mcg/min	15 mL/hr	14 mcg/min	52.5 mL/hr
5 mcg/min	18.75 mL/hr	15 mcg/min	56.25 mL/hr
6 mcg/min	22.5 mL/hr	16 mcg/min	60 mL/hr
7 mcg/min	26.25 mL/hr	17 mcg/min	63.75 mL/hr
8 mcg/min	30 mL/hr	18 mcg/min	67.5 mL/hr
9 mcg/min	33.75 mL/hr	19 mcg/min	71.25 mL/hr
10 mcg/min	37.5 mL/hr	20 mcg/min	75 mL/hr

GG. octreotide acetate

Brand: SANDOstatin®

How supplied:	50mcg/mL, 100 mcg/ml, 200 mcg/mL, and 500 mcg/ml vial;
Action:	A potent growth hormone similar to somatostatin. Inhibits serotonin release and the secretion of glucagon, gastrin, secretin, motilin, VIP, and pancreatic polypeptide.
Indications:	Esophageal varice bleeding, pancreatic fistulas
Standard concentration:	**500mcg in 100mL NS = [5 mcg/ml]** Also compatible in D5W ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	25-100mcg (Usually 50mcg) IV
IV Drip: **(after bolus)**	**Initial infusion:** 50mcg/hr **Maintenance dose:** 25 – 50 mcg/hr
Titration: (mcg/hr)	{ONLY PER PHYSICIAN ORDER} **Discontinuation: no titration necessary**
Max dose/rate:	**Definite: 100mcg/hr**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), q1hr x 2, q2hr x 2, then every 4 hours. Side Effects: Monitor for bradycardia, dysrhythmias, QT prolongation, and hypo or hyperglycemia.
NURSING UNITS	**CRITICAL CARE**
Contraindications	Hypersensitivity

OCTREOTIDE Infusion Rates 500 mcg/100 mL [5 mcg/ml]	
25 mcg/hr	5 ml/hr
50 mcg/hr	10 ml/hr
75 mcg/hr	15 mL/hr
100 mcg/hr	20 mL/hr

HH. oxytocin

Brand: Pitocin®

How supplied:	10 units/mL vial
Action:	Oxytocic hormone that produces the rhythmic uterine contractions characteristic to delivery
Indications:	Induction of labor; (Postpartum bleeding, adjunctive treatment of abortion do NOT use this concentration)
Standard concentration:	**30 Units in 500mL LR = [60 mUnits/ml] Induction** **20 Units in 1000mL LR = [20 mUnits/mL] Post-delivery**

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip:	**Initial infusion:** 0.5-2 milliUnits/min. **Maintenance dose:** Infusion rates of 6milliUnits/min provide oxytocin levels similar to those at spontaneous labor.
Titration: (mUnits/min)	Titrate in **1-2 milliUnit/min** increments at **15 minute** intervals until desired contraction pattern is established. {ONLY PER PHYSICIAN ORDER} **Discontinuation: no titration necessary;** may titrate down once desired frequency of contractions is reached and labor is at 5-6cm dilation;
Max dose/rate:	**Recommended: 10 milliUnits/min**
Monitoring: [NURSING]	Parameters: Electronic Fetal Monitoring, Vital signs, Intake and Output Side Effects (Mother): arrhythmia (incl PVCs), hypertension, nausea/vomiting, uterine hypertonicity, uterine rupture, water intoxication (antidiuretic effect) Side Effects (Neonate): arrhythmia (incl PVCs), bradycardia, seizure, CNS damage, jaundice, retinal hemorrhage
NURSING UNITS	**CRITICAL CARE, OB**
Contraindications	Hypersensitivity to oxytocin, significant cephalopelvic disproportion, unfavorable fetal positions, fetal distress, hypertonic or hyperactive uterus, contraindicated vaginal delivery (invasive cervical cancer, active genital herpes, prolapse of the cord, cord presentation, total placenta previa or vasa previa)

OXYTOCIN infusion rates 30 Units / 500mL [60 milliUnits/ml]	
1 milliUnit/minute	1 mL/hr
2 milliUnit/minute	2 mL/hr
3 milliUnit/minute	3 mL/hr
4 milliUnit/minute	4 mL/hr
5 milliUnit/minute	5 mL/hr
6 milliUnit/minute	6 mL/hr
7 milliUnit/minute	7 mL/hr
8 milliUnit/minute	8 mL/hr

II. pantoprazole

Brand: Protonix®

How supplied:	40 mg/ vial
Action:	Proton-pump inhibitor; Suppresses gastric acid secretion by inhibiting the parietal cell H^+/K^+ ATP pump
Indications:	Erosive esophagitis associated with GERD, Peptic ulcer disease, Hypersecretory disorders (ie Zollinger Ellison), Prevention of rebleeding in peptic ulcer bleed. *Restricted to GI bleed only.*
Standard concentration:	**80mg in 100 mL NS** = [0.8 mg/ml]

ADMINISTRATION GUIDELINES

Bolus:	80mg IV = 40mg/10mL NS IV push over 2 minutes x 2
IV Drip: **(after bolus)**	**Infusion:** 8mg/hr (10ml/hr)
Titration: **(mghr)**	{ONLY PER PHYSICIAN ORDER} **Discontinuation: no titration necessary**
Max dose/rate:	**Definite: 8mg/hr**
Monitoring: **[NURSING]**	Monitor for signs and symptoms of GI bleed. Consider Zinc replacement with long term use (contains EDTA) Side Effects: chest pain, headache, insomnia, dizziness, anxiety, diarrhea, flatulence
NURSING UNITS	**All Units**
Contraindications	Hypersensitivity to proton-pump inhibitors.

JJ. PHENYLephrine

Brand: Neo-Synephrine®

How supplied:	10 mg/1mL vial; 50mg/5mL vial
Action:	Powerful and selective α-1 receptor agonist causing vasoconstriction of arterioles.
Indications:	Hypotension, shock
Standard concentration:	**Std: 50 mg in 250 ml NS** = [200 mcg/ml] Also compatible in D5W **Double: 100 mg in 250 ml NS** = [400 mcg/ml] ***[Protect from light: AMBER/DARK OVERWRAP]****

ADMINISTRATION GUIDELINES

Bolus:	NONE
IV Drip: **(after bolus)**	***MUST infuse through CENTRAL line. Peripheral administration should only be utilized in emergent situations, for no longer than 8 hours.*** **Initial Infusion:** 100–180 mcg/min until BP is stable **Maintenance Infusion:** 40 – 80 mcg/minute
Titration: (mcg/min)	Titrate in **20-40 mcg/min** increments at **15 minute** intervals for BP, HR. Discontinuation: must titrate off
Max dose/rate:	**Recommended: 180mcg/min** for continued infusions **Definite: 360mcg/min** acutely (<12 hours)
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Peripheral ischemia, dysrhythmias, PVCs, hypertension, tachycardia.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Severe hypertension or ventricular tachycardia
IV EXTRAVASATION	Dilute phentolamine (Regitine®) 5 mg to 10mL with 0.9% Sodium Chloride. MD injects into IV catheter and liberally throughout infiltrated area. Monitor site. May require additional injections if blanching should recur.

PHENYLephrine Infusion Rates STANDARD: 50 mg/ 250 ml [200 mcg/ml]	
20 mcg/min	6 ml/hr
40 mcg/min	12 ml/hr
60 mcg/min	18 ml/hr
80 mcg/min	24 ml/hr
100 mcg/min	30 ml/hr
120 mcg/min	36 ml/hr
140 mcg/min	42 ml/hr
160 mcg/min	48 ml/hr
180 mcg/min	54 ml/hr
360 mcg/min	108 mL/hr

KK. procainamide

Brand: Pronestyl®

How supplied:	1000mg vial
Action:	Depresses excitability of cardiac muscle to electrical stimulation and slows conduction in atrium, bundles of HIS and ventricle increases refractory period.
Indications:	Ventricular arrhythmias; rarely for atrial arrhythmias
Standard concentration:	**1000 mg in 250mL NS = [4 mg/ml]** Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	**MAXIMUM LOADING DOSE: 1000 mg or 17 mg/kg IV** Infuse at rate of 20mg/min (or 100mg q5min) until arrhythmia is supressed, or adverse effects occur (ie hypotension, QRS widening by 50%), or until maximum loading dose is reached
IV Drip: (after bolus)	**Initial Infusion** (after arrhythmia is suppressed or maximum loading dose is reached): 1 to 4 mg/min.
Titration: (mg/min)	Titrate in **1mg/min** increments at **30 minute** intervals if necessary to control arrhythmias. **Discontinuation: no titration necessary.** Start oral procainamide at least 4hr after IV off
Max dose/rate:	**LOAD: Definite MAX Loading Dose – 1000mg or 17mg/kg** **Recommended: 20 mg/min Definite: 50 mg/min** **MAINTENANCE: Recommended: 4mg/min Definite: 6mg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring; If increase in PR, QRS, or QT segments, discontinue and call physician. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), q1hr x 2, q2hr x 2, then every 4 hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Hypotension, rash, diarrhea, nausea/vomiting, taste disorder, QT prolongation, confusion, drowsiness. Long-term administration leads to development of a (+) ANA test in 50% of patients, which may result in a drug-induced lupus erythematosus-like syndrome (20-30% of patients) Therapeutic levels: Procainamide: 4-10 mcg/mL NAPA (active metabolite): 15-25 mcg/mL
NURSING UNITS	**CRITICAL CARE*** ***PCU: only 'fixed' drips – titration only per physician order**
Contraindications	Hypersensitivity, heart block, torsades de pointes.

Procainamide Infusion Rates 1 G/ 250 ml [4 mg/ml]	
1 mg/min	15 ml/hr
2 mg/min	30 ml/hr
3 mg/min	45 ml/hr
4 mg/min	60 ml/hr
5 mg/min	75 ml/hr
6 mg/min	90 ml/hr

LL. propofol

Brand: Diprivan®

USE RASS SCALE TO MONITOR FOR SEDATION: Goal is -2 to 0

How supplied:	200 mg/20 ml vial [10mg/ml]; 1000 mg/100 ml, 500mg/50mL **PREMIX**
Action:	Produces dose-dependent CNS depression; sedative/hypnotic anesthetic
Indications:	Sedation in mechanically ventilated patients; monitored anesthesia care sedation
Standard concentration:	**1000mg in 100mL emulsion = [10 mg/ml] PREMIX** *Note: Propofol has 1.1 kCal/mL and should not be administered with Lipid infusions (same as 10% Lipids)* **500mg in 50mL emulsion = [10 mg/ml] PREMIX**

ADMINISTRATION GUIDELINES

Bolus*:	**!! Only for induction of anesthesia or moderate sedation:** 20-40mg IV every 10 seconds **!!** **NO bolus for intubation/maintenance of sedation in ICU patients** ***Administration only by ATLS certified physician and airway patent**
IV Drip:	Must change tubing every 12 hours. Discard propofol bottle if infusing >12 hours. Central line infusion preferred **Patient MUST be mechanically-ventilated to receive propofol via continuous infusion**. **Initial Infusion:** 5 mcg/kg/min **Maintenance Infusion:** 5 to 50 mcg/kg/min
Titration: (mcg/kg/min)	Titrate in **5-10mcg/kg/min** increments at 5-10 minutes intervals to inadequate sedation per RASS (Richmond Agitation Sedation Scale) to a goal of 0 to -1 **Discontinuation: must titrate off. Do not discontinue abruptly.**
Max dose/rate:	**Recommended: 50 mcg/kg/min. Definite: 80mcg/kg/min (no >6 hours)**
Monitoring: [NURSING]	Physician order must state sedation level. If maximum dosage reached, notify physician and assess need for adjunct therapy (consider addition of benzodiazepine). Parameters: Continuous ECG monitoring Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Monitor sedation level with RASS score q1hour x 2, then q2 hours. Side Effects: Monitor for bradycardia and hypotension. May cause urinary retention, green colored urine. Monitor triglyceride levels after infusions >72h.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity to drug, soybean oil, egg and hyperlipidemia.

MM. ROCuronium — Brand: Zemuron®

Non-Depolarizing Neuromuscular Blocker (Paralytic)
****USE TRAIN OF FOUR (TOF) TO MONITOR DEGREE OF PARALYSIS****
0 twitches: (100% block) The infusion rate should be reduced by 10% and the TOF reevaluated in 30 minutes
1 – 2 twitches: **Adequate blockade; reevaluate TOF daily**
3 twitches: The infusion rate should be increased by 10% and the TOF reevaluated in 30 minutes
4 complete twitches: Equal height and/or sustained head lift for ≤ 5 seconds = no more effect of the neuromuscular blocking agent
Establish patient's baseline Super Maximal Stimulus (SMS).

BE SURE PATIENT HAS ADEQUATE SEDATION (midazolam, lorazepam, propofol) & PAIN CONTROL CONCURRENTLY WHILE RECEIVING NEUROMUSCULAR BLOCKING AGENTS
OPHTHALMIC LUBRICANT MUST BE APPLIED TO BOTH EYES

How supplied:	50 mg/5 ml vial (10 mg/ml)
Action:	Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine.
Indications:	Facilitation of endotracheal intubation, skeletal muscle relaxation during mechanical ventilation.
Standard concentration:	**250 mg in 100 ml NS = [2.5 mg/ml]** Also Compatible in D5W (Withdraw 25ml from 100mL bag before adding drug. Total volume=100 ml)

ADMINISTRATION GUIDELINES

Bolus*:	0.6 – 0.9 mg/kg IV (MAX 1.2 mg/kg) *For IV use ONLY. Do NOT administer IM ***Administration only by ATLS certified physician and airway patent**
IV Drip: (after bolus) **mcg/kg/min**	***Strongly recommended for infusion to central line** **PATIENT MUST BE VENTILATED** **Initial Infusion:** 10 – 12 mcg/kg/min, started ~ 20 to 40 minutes after bolus ***(if bolus given)***. *Begin infusion only after evidence of spontaneous recovery from bolus dose, so as not to overdose.* **Maintenance Infusion:** 4 – 16 mcg/kg/min
Titration: (mcg/kg/min)	Titrate in **1 mcg/kg/min** increments at **30 minute** intervals until desired TOF (1-2 twitches). **Discontinuation: no titration necessary, but may titrate off to monitor for spontaneous recovery**
Max dose/rate:	**Definite**: 16 mcg/kg/min
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring. Monitor BP, HR, RR, with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Monitor temperature with vital signs to assess for malignant hyperthermia. Sedation and pain orders required. Side Effects: Monitor electrolytes, imbalances can increase action; Assess for patent airway before bolus administration to ensure proper ventilation
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity

NN. terbutaline

Brand: Brethine®

How supplied:	1mg/mL vial
Action:	Beta-2 agonist; inhibition of uterine contractions (decreases free intracellular calcium ions)
Indications:	Premature labor (tocolysis) *(unlabeled)*
Standard concentration:	**5mg in 500mL D5W = [10 mcg/ml]** Also compatible in NS

ADMINISTRATION GUIDELINES

Bolus:	None necessary
IV Drip:	**Initial Infusion**: 2.5 - 10mcg/min
Titration: (mcg/min)	Titrate in **2.5mcg/min** increments at **15 minute** intervals to desired tocolysis. **Discontinuation: no titration necessary.** Start oral 5mg at least 4 hr after IV off.
Max dose/rate:	**Recommended: 25 mcg/min**
Monitoring: [NURSING]	Parameters: Monitor BP, HR, RR, with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. ECG monitoring if possible. Potassium, serum glucose. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: HYPERglycemia, hypotension, tachycardia, hypokalemia, pulmonary edema, chest pain, arrhythmias. Neonatal: HYPOglycemia, tachycardia and other cardiovascular complications
NURSING UNITS	**CRITICAL CARE, OB**
Contraindications	Uncontrolled diabetes, cardiac arrhythmias associated with tachycardia, thyrotoxicosis

Terbutaline Infusion Rates 5mg/500mL D5W [10mcg/mL]	
2.5 mcg/min	15 mL/hr
5 mcg/min	30 mL/hr
7.5 mcg/min	45 mL/hr
10 mcg/min	60 mL/hr
12.5 mcg/min	75 mL/hr
15 mcg/min	90 mL/hr

OO. vasopressin

Brand Name: Pitressin®

How supplied:	20 units/1 ml vial [20 units/ml]
Action:	Promotes reabsorption of water by acting on renal tubular epithelium, causes vasoconstriction and increases systemic vascular resistance (SVR)
Indications:	Diabetes Insipidus, bleeding esophageal varies, shock.
Standard concentrations:	**GI Hemorrhage: 60 units in 250 mL NS = [0.24 units/mL]** **SHOCK: 20 units in 250 mL NS = [0.08 units/mL]** Also Compatible in D5W

ADMINISTRATION GUIDELINES

Bolus:	None necessary. 20 units IV Push - only for Pulseless Vtach/Vfib or asystole.
IV Drip: **(after bolus)**	***MUST infuse through CENTRAL line. Peripheral administration should only be utilized in emergent situations, for no longer than 8 hours.*** **Initial Dose:** GI hemorrhage: 0.1-0.4 units/minute *suggested to receive IV Nitroglycerin concurrently to prevent myocardial ischemic complications.* Shock: 0.01-0.04 units/min; or Fixed dose of 0.04 units/min **Maintenance Range:** GI hemorrhage: 0.2-0.8 units/minute Shock: Up to 0.04 units/min fixed dose
Titration: (units/min)	GI hemorrhage: Titrate in **0.1unit/minute** increments at **15 minute** intervals to ordered dose. {TITRATION ONLY AS PER PHYSICIAN ORDER} Shock: Titrate in **0.005unit/min** increments at **15 minute** intervals to BP or MAP (usually to fixed dose of 0.04units/min) **Discontinuation: must titrate off.**
Max dose/rate:	**GI hemorrhage: Definite: 1 unit/minute** **Shock: Definite: 0.04 units/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring. Monitor BP, HR, RR with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Side Effects: Monitor for vasoconstriction, tremor.
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity, chronic nephritis.

GI HEMORRHAGE - continuous	
Vasopressin 60 units/250 ml [0.24 units/mL]	
0.1 units/min	25 mL/hr
0.2 units/min	50 mL/hr
0.3 units/min	75 mL/hr
0.4 units/min	100 mL/hr
0.5 units/min	125 mL/hr
0.6 units/min	150 mL/hr
0.7 units/min	175 mL/hr
0.8 units/min	200 mL/hr
0.9 units/min	225 mL/hr
1 unit/min	250 mL/hr

SHOCK – titrate or continuous	
Vasopressin 20 units/250 ml (0.08 units/mL)	
0.005 units/min	3.75 mL/hr
0.01 units/min	7.5 mL/hr
0.015 units/min	11.25 mL/hr
0.02 units/min	15 ml/hr
0.025 units/min	18.75 mL/hr
0.03 units/min	22.5 mL/hr
0.035 units/min	26.25 mL/hr
0.04 units/min	30 mL/hr

PP. vecuronium

Brand Name: Norcuron®

Non-Depolarizing Neuromuscular Blocker (Paralytic)
****USE TRAIN OF FOUR (TOF) TO MONITOR DEGREE OF PARALYSIS****
0 twitches: The infusion rate should be reduced by 10% and the TOF reevaluated in 30 minutes
1 – 2 twitches: Adequate blockade; reevaluate TOF daily
3 twitches: The infusion rate should be increased by 10% and the TOF reevaluated in 30 minutes
4 complete twitches of equal height and/or sustained head lift for ≤ 5 seconds = no more effect of the neuromuscular blocking agent
Establish patient's baseline Super Maximal Stimulus (SMS).

BE SURE PATIENT HAS ADEQUATE SEDATION (midazolam, lorazepam, propofol) & PAIN CONTROL CONCURRENTLY WHILE RECEIVING NEUROMUSCULAR BLOCKING AGENTS
OPHTHALMIC LUBRICANT MUST BE APPLIED TO BOTH EYES

How supplied:	10mg/vial (powder for reconstitution); dilute with 10mL SW
Action:	Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine.
Indications:	Facilitation of endotracheal intubation, skeletal muscle relaxation during mechanical ventilation.
Standard concentration:	**50mg in 100mL NS =** [0.5mg/ml] Also compatible in D5W

ADMINISTRATION GUIDELINES

Bolus*:	**Bolus Dose:** 0.08 – 0.1 mg/kg IV push *For IV use ONLY. Do NOT administer IM. ***Administration only by ATLS certified physician and airway patent**
IV Drip: (after bolus)	***Strongly recommended for infusion to central line** **PATIENT MUST BE VENTILATED** **Initial Infusion:** 0.8–1.2 mcg/kg/min started ~20 to 40 min after bolus dose *(if bolus given)* *Begin infusion only after evidence of spontaneous recovery from bolus dose, so as not to overdose.*
Titration: (mcg/kg/min)	Titrate in **0.1 mcg/kg/min** increments at **30 minute** intervals until desired TOF (1-2 twitches) **Discontinuation: no titration necessary, but may titrate off to monitor for spontaneous recovery**
Max dose/rate:	**Definite: 1.7 mcg/kg/min**
Monitoring: [NURSING]	Parameters: Continuous ECG monitoring. Monitor BP, HR, RR, with initiation/change in infusion rate: q15min x 4 (or continue until stable), then q1hour x 2, then q2hours. Weigh patient at start of infusion and daily; monitor intake and output. Monitor temperature with vital signs to assess for malignant hyperthermia. Sedation and pain orders required. Side Effects: Monitor electrolytes, imbalances can increase action; Assess for patent airway before bolus administration to ensure proper ventilation
NURSING UNITS	**CRITICAL CARE [not PCU]**
Contraindications	Hypersensitivity

SPECIAL NOTE FOR ALL MEDICATIONS:

1. Vital signs and hemodynamic parameters should be monitored as per standard of care.
2. Patients should be observed for adverse drug effects and/or toxicity.
3. Lab values and therapeutic ranges should be monitored as ordered.
4. IV site should be checked often for patency and signs of infiltration/extravasation.
5. For non-standard concentrations and compatibility questions, always consult Pharmacy.

REFERENCES

AHFS Drug Information 2004-13
Drug Facts and Comparisons 2004-13
Lexi-Comp's Online 2004-13, 2013-09
Micromedex 2004-13
Mosby's Intravenous Medications 2004-13
Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU, 2013-01

Approved by:	HRMC P&T Committee 1/06, 11/09, 7/10, 5/11(Heparin modification), 11/12, 7/13, 9/13 (Addition of RASS Scale, removal of Meperidine PCA)
Reviewed by:	HRMC Nursing Practice Council, Nursing Quality Council Pharmacy and Nursing Committee

INOTROPIC AGENTS										
Drug	**Standard**	**Dosing**	**α**	**β_1**	**β_2**	**DA**	**HR**	**CO**	**SVR**	**nts/ Adverse Effects**
Epinephrine (Adrenalin)	4mg/ 250mL	1-10 mcg/min (0.02-0.2 mcg/kg/min)	+++	++	+	–	↑	↑	↑	Predominate α effects at high dose
Dobutamine (Dobutrex)	500mg/ 250mL	1-20 mcg/kg/min	–	++++	+	–	↑	↑↑	↓	Tachyphylaxis, arrhythmias; may reduces SVR by acting as an alpha$_1$ *antagonist*
Dopamine (Intropin)	400mg/ 250mL	1-5 mcg/kg/min 5-10 mcg/kg/min 10-20 mcg/kg/min	+ ++ ++++	+ +++ ++++	+ – –	++++ ++ +	– ↑ ↑	– ↑↑ ↑↑	– ↑ ↑↑	Dose dependent renal vasodilation, tachycardia
Isoproterenol (Isuprel)	1mg/ 250mL	2-10 mcg/min	–	++++	+++	–	↑	↑	↓↓	Good pulmonary dilator, arrhythmias, tachycardia
PRESSOR AGENTS										
Norepinephrine (Levophed)	4mg/ 250mL D5W only	1-30 mcg/min	++++	+	–	–	↑	↓	↑↑	↑ MVO_2, vaso-nstriction
Phenylephrine (Neo-synephrine)	50mg/ 250mL	40-360 mcg/min	+++	–	–	–	–	–	↑	α effects may cause reflex bradycardia
Vasopressin (Pitressin)	20units/ 250mL	0.04-0.4units/min, **Not to exceed 1unit/ min**	–	–	–	–	–	–	↑	GI bleed: 0.1-0.4 units/min Shock: 0.01-0.04 units/min

Drip Rate Calculations: **ml/hr = $\frac{\text{mcg/kg/min x kg x 60min/hr}}{\text{mcg/ml}}$** **mcg/kg/min = $\frac{\text{mcg/ml x ml/hr}}{\text{kg x 60 min/hr}}$**

VENO/ARTERIAL DILATORS								
Drug		**Dosing**	**Arterial**	**Venous**	**MOA**	**CO**	**SVR**	**Comments/ Toxicity**
Nitroglycerin	50mg/ 250mL D5W; glass	5-200 mcg/min	+	++++	**Direct venodilator**	–	↓	Coronary vasodialator. Tolerance may develop
Nitroprusside (Nipride)	50mg/ 250mL D5W only	0.25-10 mcg/kg/min	++++	++	**Direct arterial & venous dilation**	↑	↓↓	Cyanide (hepatic) & thiocyanate (renal, keep <10mg/dl)
Milrinone (Primacor)	20mg/ 100mL	0.3-0.75 mcg/kg/min, use lower dose in renal insufficiency	++++	+	**Phospho-diesterase Inhibitor**	↑↑	↓↓	Thrombocytopenia, arrhythmia's; Also considered an inotrope; renal adjustment necessary
Fenoldopam (Corlopam)	10mg/ 250mL	0.1-1.6mcg/kg/min	++++	+	**D-1 (dopamine) Receptor agonist**	↑	↓↓	Vasodilator of coronary, renal, mesenteric and peripheral arteries. No renal adjustment necessary
Nesiritide (Natrecor)	1.5mg/ 250mL	0.01-0.03mcg/kg/min	++	++	**B-type natiuretic peptide**	↑	↓↓	Diuretic properties; for acute, decompensated heart failure