CEDARS-SINAI MEDICAL CENTER

Pharmacy and Therapeutics Committee Approvals, August 2015

Agenda Item	P&T Committee Decision
Drugs for Formulary Consideration	**Ivabradine (Corlanor®)** - added to formulary for use in patients on the medication prior to admission Indications: reduce risk of hospitalization from worsening heart failure (HF) in patients with stable, symptomatic chronic HF with left ventricular ejection fraction (EF) of ≤ 35%, who are in sinus rhythm with resting heart rate ≥ 70 beats per minute and are on maximally tolerated doses of β-blockers (or have a contraindication). Usual dose: 2.5-7.5mg twice daily with meals Adverse Effects: Significant adverse reactions include fetal toxicity, atrial fibrillation, bradycardia, and conduction disturbances. Drug – Drug Interactions: Medications that can inhibit CYP3A4 should be avoided in patients that are currently taking ivabradine due to increased plasma concentrations may exacerbate bradycardia and conduction disturbances. Non-dihydropyridine calcium channel blockers (CCB), (i.e. verapamil, diltiazem) should not be combined with ivabradine. Caution should be used when used with QT prolonging medications and potassium-depleting diuretics due to an increased risk of cardiac arrhythmias. Contraindications: Ivabradine is contraindicated in those with a hypersensitivity to ivabradine or any of its components, resting HR <60 bpm prior to initiation of therapy, acute decompensated heart failure (ADHF), blood pressure (BP) below 90/50 mmHg, sick sinus syndrome, sinoatrial block or 3rd degree atrioventricular (AV) block (unless a functioning demand pacemaker is present), dependency on a pacemaker, severe hepatic impairment, pregnancy, lactation, and women of child-bearing potential not on appropriate contraceptive. The concomitant use of strong CYP3A4 inhibitors is contraindicated (eg, azole antifungals, macrolide antibiotics, HIV antiretroviral protease inhibitor, nefazodone). Precautions: • Ivabradine should not be used to treat any form of cardiac arrhythmia and/or second-degree AV block. • Treatment should not be initiated in patients with a HR below 60 bpm. If during treatment, the HR drops below 50 bpm and/or the patient experiences symptoms of hypotension (eg, dizziness, fatigue), the dose should be titrated down immediately; if symptoms of bradycardia are apparent, it should be discontinued • Ivabradine should not be used immediately following a stroke. • There is a risk of potential QT-segment prolongation due to HR reducing effects of ivabradine. • Heart failure should be stable and treatment optimized before initiating therapy with ivabradine. • Ivabradine may affect retinal function; cessation should be considered if any changes in vision occur. Special caution should be used in patients with retinitis pigmentosa. • If used in those above 75 years old, a lower starting dose (2.5 mg BID) can be considered and titrated to HR • In those with a history of conduction defects, or in whom bradycardia would cause hemodynamic compromise, 2.5 mg orally (PO) BID should be initiated and titrated based on HR Monitoring: HR and BP checks are recommended (prior to initiation, prior to increasing dose, and after decreasing dose), within 2 to 4 hours of the dose. Patients receiving ivabradine should be monitored for the presence of atrial fibrillation, including periodic electrocardiogram monitoring. **Ceftriaxone (Rocephin®)** – added to formulary Indications: cephalosporin antibiotic indicated for multiple infections including: lower respiratory tract infections, skin and skin structure infections, urinary tract infections, bone and joint infections, meningitis, etc. Usual dose: 1-2 grams IV every 12-24 hours Adverse Effects: injection site irritation, skin rash, diarrhea, thrombocytopenia, and increased transaminases Contraindications: hypersensitivity to ceftriaxone. Do not use in hyperbilirubinemic neonates or in neonates receiving concomitant intravenous calcium-containing solutions. Monitoring: Observe for signs/symptoms of anaphylaxis. **Isavuconazole (Cresemba®)** – not added to formulary Indications: indicated for patients 18 years of age or older for the treatment of invasive Aspergillosis and Mucormycosis Usual dose: The IV and PO loading dose is 200mg every 8 hours for 6 doses followed by 200mg isavuconazole once daily. Adverse Effects: Nausea, vomiting, diarrhea, headache, elevated liver function tests, hypokalemia, constipation, dyspnea, cough, peripheral edema and back pain Contraindications: Known hypersensitivity to isavuconazole, coadministration of strong CYP 3A4 inhibitors such as ketoconazole or high-dose ritonavir, coadministration of strong CYP 3A4 inducers such as rifampin, carbamazepine, St. John's wort, or long acting barbiturates, or familial short QT syndrome Precautions: Hepatic adverse drug reactions (elevation in liver-related laboratory tests and more severe reactions such as hepatitis, cholestasis, or hepatic failure) and infusion-related reactions Monitoring: Liver function tests (AST, ALT, alkaline phosphatase, total bilirubin) at baseline and periodically during therapy

Other Formulary Changes

- **Cefotaxime (Claforan®)** – removed from formulary, restrict use to neonates ≤ 28 days of age, particularly those who are hyperbilirubinemic and/or premies with concurrent continuous administration of calcium-containing IV solutions (including parenteral nutrition)

Automatic Substitutions

Medication Ordered	Automatic Substitution
Cefotaxime 2 gm IV Q6 - Q24H	Ceftriaxone 2 gm IV Q24H
Cefotaxime 2 gm IV Q4H	Ceftriaxone 2 gm IV Q12H

Reverse previous ceftriaxone to cefotaxime auto-sub. Changes to CS-Link order sets were submitted and will be updated.

- **Removed from Formulary**
  - Amiloride HCl/ Hydrochlorothiazide 5mg/50mg – separate agents available
  - Etidronate 200 mg, 400 mg tablets/Sodium fluoride 2 mg chewable tablets - removed due to low usage
  - Etodolac 400 mg, 500 mg, 600 mg ER tablets – IR tablets remain on formulary
  - Magnesium chloride 64mg tablets- removed due to low usage: auto-substitution below
  - Cimetidine 200mg, 300mg,400mg tablets - removed due to low usage: auto-substitution below
- **Automatic Substitutions**

Medication Ordered	Automatic Substitution
Magnesium chloride 64mg PO BID	Mg Plus® 133mg (magnesium protein complex)133mg PO daily
Magnesium chloride 128mg	Mg Plus® 133mg (magnesium protein complex), same frequency
Cimetidine 200 – 400 mg per day	Ranitidine 150 mg PO daily
Cimetidine 600 mg/day up to 1600 mg/day	Ranitidine 150 mg PO BID
Heparin 25,000/250mL D5W	Heparin 25,000/250mL 0.45% NS (new default solution)

- **Oxytocin 30 units/500ml and the 20units/1000ml** - changed default solution from LR to NS

Anticoagulation Updates

Heparin Monitoring Transition from aPTT

Heparin Level Monitoring FAQs 08 1

Therapeutic Heparin Infusion Monitoring Update

Heparin level monitoring for therapeutic heparin infusions was approved at the December 2014 P&T meeting. The housewide transition from aPTT to heparin level (via anti-Xa activity) monitoring for patients receiving therapeutic heparin infusions will be implemented in two phases.

- Phase I will include heparin level monitoring for patients managed by pharmacists which will be implemented on Monday, November 2, 2015.
- Phase II, in which all patients on therapeutic heparin will be monitored by heparin levels, will be implemented on Monday, December 7, 2015.

Other Updates

Alum Bladder Irrigation Update 07 1

PICU code sheet 08 15.pdf

PICU Code Sheet for 50 kg or above 08 15

Alum Irrigation & Intravesical Formalin Instillation for Hemorrhagic Cystitis Update

A guideline for the treatment of hemorrhagic cystitis and criteria for use of alum irrigation and intravesical formalin administration was initially approved in August 2014. Changes to the guideline include a new recommendation that formalin 10% be allowed and restricted to patients with HC due to radiotherapy for bladder tumor AND those who failed lower concentrations.

ICU Sedation Protocol: CICU Expansion

The MICU sedation protocol resulted in the following:

- Increased: RASS documentation and achievement of light sedation goals
- Decreased: use of benzodiazepine infusions, rate of self-extubations, and ICU LOS
- Improved collaboration among pharmacists, nurses and MDs

For the reasons above, this protocol has been extended to CICU.

Pediatric Pharmacy & Therapeutics Committee

- PICU Code Sheet for < 50kg and PICU Code Sheet for ≥ 50kg – revision
- Pediatric & Neonatal Medication Code Sheet in CS-Link

Currently, PEDS/PICU and NICU have Medication Code Sheets (also used in ED for pediatric patients) that calculate weight-based dosages. Staff manually enters patient name, MRN and weight which could lead to transcription errors. To reduce this risk, Pediatric and Neonatal Medication Code Sheets will be built in CS-Link.

Standardization of heparin flushes in the perioperative areas

Several heparin flush preparations are compounded by MD/RN in the ORs. Because regulatory agencies require compounded medications to be prepared by pharmacy personnel unless needed emergently or medication stability is short, the following will be implemented:

- Standardize heparin flush products used in the ORs to:
  - Heparin 10 units/ml 500 ml NS bags prepared in the Pharmacy.
  - Store Pharmacy-prepared heparin flush bags in the OR refrigerators with a 9-day Beyond-Use-Date (BUD).
- Stock the commercially available heparin 2 unit/ml 500ml NS bag in 8OR.
- Safety Strategies: Only heparin "infusion" product stored in the OR and affix an auxiliary label "For Flush Only" to each bag

Updated Policies, Guidelines, and Order Sets	The following policies, guidelines, and order sets were updated; please refer to the Policy & Procedure Manager (PPM) and Pharmacy Intranet for the most updated documents: **Guidelines, Policies & Procedures Update** • Syringe Pump Medication Administration in the Newborn-Neonate Clinical Guideline: General Clinical/Clinical Guideline http://cshsppmweb/dotNet/documents/?docid=14673&mode=view • GI Motility Program: Secretin-Stimulated Serum Gastrin Test Work Paper: General Clinical/Clinical Guideline (no changes) http://cshsppmweb/dotNet/documents/?docid=22483&mode=view • GI Motility Program: Breath Testing: Urea Procedure: General Clinical/Clinical Guideline (no changes) http://cshsppmweb/dotNet/documents/?docid=22482&mode=view • Medications Prescribed by Nurse Practitioners-Certified Nurse Midwives Standardized Procedure Policy http://cshsppmweb/dotNet/documents/?docid=30491&mode=view • Malignant Hyperthermia Carts & Kits - Replacement, Checking and Exchange (MM.03.01.03.b) Procedure: Medication Management http://cshsppmweb/dotNet/documents/?docid=25755&mode=view • Hypothermia (Code Cool) and Normothermia Adult Management in Acute Temperature Modified Brain Injury Policy: Clinical Manual / General Clinical http://cshsppmweb/dotNet/documents/?docid=35697&mode=view • Intravenous Therapy: Initiation and Management of Peripheral Intravenous Lines Policy: Clinical Manual/General Clinical http://cshsppmweb/dotNet/documents/?docid=31824&mode=view **IV Guidelines Update** http://web.csmc.edu/clinical/clinical-departments/pharmacy/iv-guidelines.aspx • Immune Globulin (Gamunex®) IV Guidelines – I110 • Pentobarbital (Nembutal®) IV Guidelines – P160 **Order Sets/Other** • Post-Partum Hemorrhage order set • Chemocare.com – approved reference for patient education • Chemotherapy & Road Map - Road Map of Myeloablative Allogeneic Hematopoietic Progenitor Cell Haploidentical Transplant (FluBuCy) - 7049-O Adult Chemotherapy Orders: FluBuCy (MA HAPLO) + ALLO SCT - 7316 A – Outpatient Intravenous Immunoglobulin (IVIG) Order

Requests for full monographs or questions regarding this listing may be addressed to the Drug Information Center at **(310) 423-3784**

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THERAPEUTIC HEPARIN INFUSION MONITORING CHANGE TRANSITIONING FROM APTT TO HEPARIN LEVEL (VIA ANTI-XA ASSAY)

BACKGROUND:

- aPTT, currently used for heparin monitoring is an ***indirect*** surrogate measure of heparin effect
  - 57% (232/407) of aPTTs DO NOT correlate[1] with unfractionated heparin levels
- **Heparin Level Monitoring (via anti-Xa assay)** is a ***direct*** measure of heparin effect (measures factor Xa inhibition by heparin)
  - Cost is roughly equivalent to that of aPPT testing
- **Heparin level monitoring (via anti-Xa assay) is advantageous**
  - Unaffected by concomitant therapy with warfarin, direct thrombin inhibitors, altered levels of coagulation factors, lupus anticoagulant, heparin binding proteins, vitamin K deficiency
  - Therapeutic range (0.3-0.6 units/ml) does not vary between laboratories
    - 45-50% fewer dose changes/24 hours[2,3]
    - 11-13% fewer monitoring tests/24 hours[2,3]

1. Internal Study Presented at 2010 Western States Conference for Pharmacy Residents, Fellows and Preceptors
2. Guervil DJ, et al. Activated Partial Thromboplastin Time versus Antifactor XA Heparin Assay in Monitoring Unfractionated Heparin by Continuous Infusion. Ann Pharmacotherapy 2011;45:861-8
3. Rosborough TK. Monitoring Unfractionated Heparin Therapy with Anti-Xa activity Results in Fewer Monitoring Tests and Dosage Changes than Monitoring with aPTT. Pharmacotherapy 1999;19:760-766

IMPLEMENTATION PLAN

- **Monday, November 2, 2015 –** patients managed **by pharmacists** will be monitored by heparin levels **only**
- **Monday, December 7, 2015 – ALL** patients on **therapeutic** heparin infusion will need to be monitored by heparin levels; aPTT will no longer be available for monitoring therapeutic heparin infusions
  - Pharmacist to call prescribers for MD managed cases with reminders
    - Order Baseline aPTT
    - Order Heparin Levels for duration of heparin therapy
  - **aPTT will be limited to:** baseline value prior to initiation of heparin, monitoring argatroban & diagnostic testing
  - **In the laboratory** – aPTT will no longer be available for monitoring therapeutic heparin infusions
  - **In CS-Link** – order sets/panels will be updated & prescribers will be prompted to order Heparin Levels
- **Institutional Champions**
  - Oksana Volod, MD - Director, Coagulation Consultation Service, Associate Professor, Cedars-Sinai Medical Center
  - Sylvia Martin-Stone, PharmD, BCPS – Clinical Pharmacist, Department of Pharmacy Services

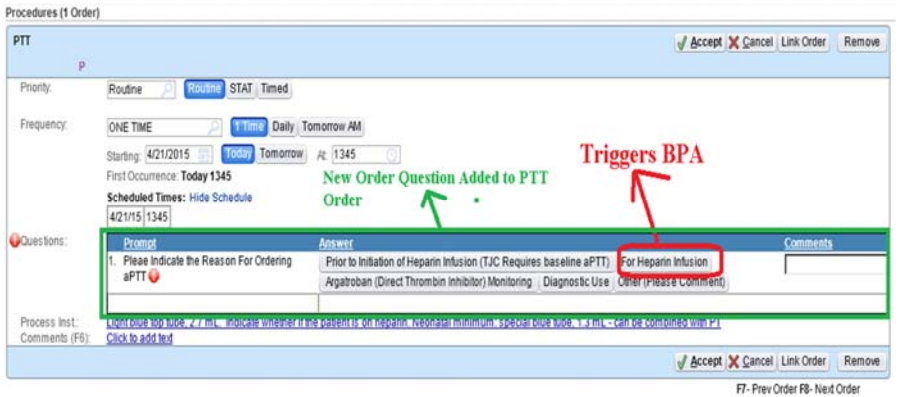
COMMUNICATION/EDUCATION PLAN

- **Physicians and Physician Leadership Notification**
  - Notification to PICs (August – October 2015)

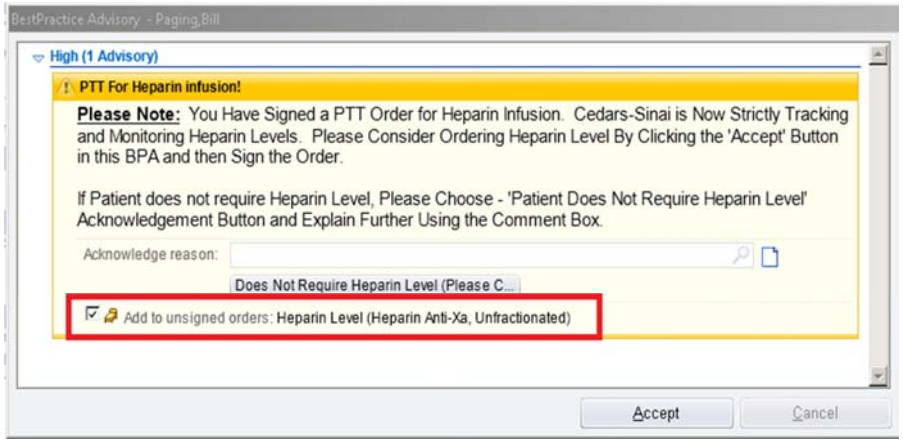
Neurology	Trauma	Pulmonology
Neurosurgery	Pediatrics	Anesthesiology
Surgery	Department of Medicine	Nephrology
Ob-Gyn	PM&R	
ED	Cardiology	

  - Slides/FAQs/'Dear Colleague Letter'/Laboratory Bulletin to Medical Staff and Physician Leadership
  - Pulse/Sutures
  - Product Information Update (PIU)
  - Housewide Screensaver
- **Educational Venues**
  - Grand Rounds – Oksana Volod, MD – November 2015
  - Coagulation Symposium – September 12, 2015
  - House staff Noon Conference – May 27, 2015 (done), October 2015
- **Nurses and Nursing Leadership**
  - Slides/FAQs/'Dear Colleague Letter'/Laboratory Bulletin to Nursing Leadership
  - Nursing Notes
  - Product Information Update (PIU)
  - Unit-based nursing inservices by pharmacists
  - Healthstream program

CCAG APPROVED: PTT ORDER ENTRY WITH NEW ORDER QUESTION



BPA For Physicians:
Order Heparin Level When aPTT is Signed for Heparin Infusion



CCAG Approved: Updated Display Names for Orders Below

CURRENT DISPLAY	PROPOSED DISPLAY
HEPARIN ANTI-XA, UNFRACTIONATED [LAB1333]	HEPARIN LEVEL (HEPARIN ANTI-XA, UNFRACTIONATED) [LAB1333]
HEPARIN ANTI-XA, LOW MOLECULAR WEIGHT [LAB316]	LOW MOLECULAR WEIGHT HEPARIN LEVEL (HEPARIN ANTI-XA, LOW MOLECULAR WEIGHT) [LAB316]

Order Name Updates

- **Preference Lists**
- **Order Sets / Smart Groups**
- **Order Panels**
- **Best Practice Advisory defaults (if any)**

Therapeutic Heparin Infusion Monitoring
FAQ's: Transitioning from aPTT to Heparin Level Monitoring (via Anti-Xa assay)

Department of Pharmacy Services and Department of Pathology and Laboratory Medicine

August 2015

1. When is this change going to happen?

a. Heparin level monitoring (via anti-Xa assay) is in the current protocol and available for ordering (Heparin Anti-Xa, Unfractionated; Lab1333)
b. Starting **Monday, November 2, 2015** – patients managed by pharmacists will be monitored with heparin levels **only**.
c. Starting **Monday, December 7, 2015** – all patients receiving therapeutic heparin infusion will be monitored by heparin levels only (please refer to Heparin Protocol on the Clinical Resources Homepage under Joint Commission; aPTT will no longer be available for monitoring heparin therapy (other than for baseline value prior to initiation of heparin)

2. How do I order a heparin level (anti-Xa assay)?

a. The heparin level is available in CS-Link as 'Heparin Anti-Xa, Unfractionated' (Lab1333). This will be renamed 'Heparin Level (Heparin anti-Xa, unfractionated)' prior to implementation date and will remain Lab1333.
b. A **factor X level** (Lab 758) should **NOT** be ordered as this is an assay of the amount of factor X in the plasma.

3. Is there any change to how Low Molecular Weight Heparin levels should be ordered?

Yes. This will be renamed 'Low Molecular Weight Heparin Level (Heparin anti-Xa, Low Molecular Weight)' prior to implementation date and will remain Lab316.

4. What is the therapeutic heparin level for unfractionated heparin infusions?

The therapeutic heparin level for unfractionated heparin is **0.3-0.7units/ml**, currently corresponding to an **aPTT of 65-117 seconds.**

5. Will heparin level monitoring and adjustments be included in the heparin protocol?

Yes. Please see heparin protocol on Clinical Resources Homepage under Joint Commission. Heparin levels for the 3 Medical Center approved aPTT goal ranges are available:

a. Standard Bleeding Risk: **aPTT 65-117** seconds corresponds to a **heparin level of 0.3-0.7 units/ml**
b. Higher Bleeding Risk/ACS/Hypothermia Patients: **aPTT 53-98** seconds corresponds to a **heparin level of 0.21-0.55 units/ml**
c. Post-Op/Trauma/VAD Patients: **aPTT 40-60** seconds corresponds to a **heparin level of 0.11-0.27 units/ml**

6. Should a baseline aPTT/PT/INR still be drawn prior to initiation of therapeutic heparin?

Yes, a baseline aPTT/PT/INR aims to detect any underlying coagulopathy and continues to be a valuable diagnostic tool. This should be **drawn prior to initiation of heparin infusion** therapy as in the current protocol. Heparin will be started immediately following the blood draw and will not be delayed pending the result.

7. For Prescribers: Will there be a Best Practice Alert (BPA) to help us order the correct lab?

Yes. If an aPTT is ordered, you will be alerted and asked if this is for a baseline aPTT, argatroban therapy, diagnostic use or 'other'. If the indication is one of these, the order can be signed.
If the answer is 'for heparin infusion', a BPA will pop-up with a reminder to order a heparin level for monitoring heparin infusions and will provide the option of accepting the BPA and then signing the order.

8. When are heparin levels run and how long from the time of blood draw until the result is available in CS-Link?

Heparin levels are available 24/7. Routine requests are typically available within 3 hours, as is currently the case with the aPTT.

9. What tube is used for heparin levels? Can the aPTT/PT/INR specimen also be drawn into this tube?

The aPTT/PT/INR/Heparin Level specimen can be collected in a 'blue top' tube.

10. How long after initiating UFH can an accurate steady state heparin level be drawn?

As with the aPTT, steady state is achieved 6 hours following an UFH bolus dose and infusion initiation. This is in the current protocol and will not change.

11. How often should heparin levels be ordered while a patient is on therapeutic heparin?

Frequency of monitoring will remain as currently outlined in the heparin protocol.

12. In what clinical situations would the aPTT still be appropriate and allowed to be ordered?

- Monitoring argatroban therapy
- Diagnostic uses (i.e., aPTT mixing study)
- Other:
    - Tandem Heart heparin infusions (non-standard concentration 90,000 units/1000ml)

13. Who should I contact with questions?

The unit pharmacist is available to answer any questions.

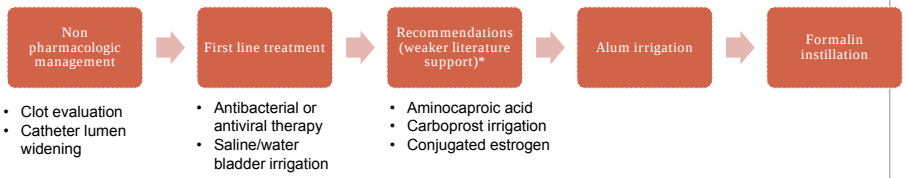
Alum Irrigation & Intravesical Formalin Instillation for Hemorrhagic Cystitis – Criteria for Use

- The physician must discuss the benefits and risks of a medication made from non-sterile powder with the patient and document conversation in the medical record
  - The physician & the patient must sign the consent form
- Not be used in patients with severe renal failure (CrCl <30mL/min)
- Alum can be used for treatment of severe HC if the patient has failed the following:
  - Clot evaluation, wide lumen catheter
  - Saline/water bladder irrigation (BI)

AND ≥ 1 of the below therapy

  - Antibacterial or antiviral therapy (if due to infectious etiology)
  - Aminocaproic acid
    - Patient should be clot-free before starting aminocaproic therapy & used in conjunction with continuous BI
    - Cannot be used for upper tract hemorrhage. Clot formation within the ureter can lead to obstruction and acute renal failure
  - Conjugated estrogen
  - Carboprost bladder irrigation
- Formalin can be used in patients who have failed alum therapy
  - To comply with regulatory requirements, exact formalin concentration should be ordered in CS-Link
  - Maximum formalin instillation time is 15minutes, maximum concentration 4%
  - Formalin 10% to be reserved only for patients with HC due to radiotherapy for bladder tumor AND failed lower concentrations

Guidelines for the Treatment of Hemorrhagic Cystitis



- Clot evaluation
- Catheter lumen widening

- Antibacterial or antiviral therapy
- Saline/water bladder irrigation

- Aminocaproic acid
- Carboprost irrigation
- Conjugated estrogen

- Carboprost appears to have lower effectiveness with significantly higher cost compared to aminocaproic acid and conjugated estrogen.
- Potential side effects/complications
  - Aminocaproic acid: thromboembolic complications, hypotension, cardiac arrhythmias, and rhabdomyolysis. Long-term doses may cause hepatic failure in patients with cirrhosis, acute renal failure and myoglobinuria
  - Conjugated estrogens: thromboembolism, increased risk of cancer

Dosing Recommendations

- **Aminocaproic acid**
  - Oral: 150 mg/kg divided Q6H x up to 3 weeks ($87/day)
  - Intermittent instillation: 2.5% solution instilled for 1 hour TID x 3 days ($5.13/day)
  - CBI: 200 mg/1 L NS x 24 hours after urine becomes clear
- **Carboprost bladder irrigation** ($817-1,634/day)
  - 0.5% carboprost solution 50-100 ml instilled for 1 hour (change position Q15 mins), followed by NS CBI for 2 hours QID x 4-5 days
  - Consider oxybutynin 5-10mg PO prior to each instillation to minimize bladder spasms
- **Conjugated estrogen**
  - IV (may precede oral dosing): 1 mg/kg BID for 2 days ($697/day)
  - Oral: initial dose: 2.5 mg BID (may increase to 5 mg BID) ($13 - $26/day)
- **Alum**
  - Maximum duration of alum therapy 3 days - CS-Link autostop; MD must document rationale in progress note if order is renewed
  - Maximum concentration 1%
- **Formalin**
  - For patients who failed alum therapy
  - Maximum formalin instillation time is 15minutes, maximum concentration 4%
  - Formalin 10% to be reserved only for patients with HC due to radiotherapy for bladder tumor AND failed lower concentrations

PICU Emergency Medications

Name: **Weight (kg):** 10
MRN:

Drug	Dose	Conc	Final Dose	Final (ml)	Comments
Code Medication Administration Guide					
Adenosine dose #1	100 mcg/kg	3 mg/ml	1 mg	0.33	Give via fast IVP
Adenosine dose #2	200 mcg/kg	3 mg/ml	2 mg	0.67	
Amiodarone ~~Dilution~~	5 mg/kg	~~2.5~~ 50 mg/ml	50 mg	~~20~~ 1	~~Dilute 1:20 to 2.5 mg/ml.~~ Rapid IV bolus for pulseless VT/VF~~, otherwise over 20-60 min~~
Atropine	0.02 mg/kg	0.1 mg/ml	0.2 mg	2.00	Minimum dose 0.1 mg. ETT dose = 2-3 times of IV dose
CaChloride 10%	10 mg/kg	100 mg/ml	100 mg	1.00	
Epinephrine IV 1:10,000	0.01 mg/kg	0.1 mg/ml	0.1 mg	1.00	
Epinephrine ETT 1:1,000	0.1 mg/kg	1 mg/ml	1 mg	1.00	Maximum dose 2.5 mg
Glucose 50%	0.5 gm/kg	0.5 gm/ml	5 gm	10.00	Dilute 1:1 sterile H2O if given by peripheral vein. 2 ml/kg of diluted glucose solution should be administered
Insulin, Regular	0.1 unit/kg	100 unit/ml	1 unit	0.01	IV Push. Give with glucose for hyperkalemia.
Lidocaine	1 mg/kg	20 mg/ml	10 mg	0.50	ETT dose = 2-3 times of IV dose
Magnesium Sulfate	50 mg/kg	500 mg/ml	500 mg	1.00	Give IV over 10-20 min
Naloxone	0.01 mg/kg	0.4 mg/ml	0.1 mg	0.25	May give 0.01 - 0.1 mg/kg. ETT dose = 2-3 times of IV dose
Sodium Bicarbonate 8.4%	1 mEq/kg	1 mEq/ml	10 mEq	10.00	
Vasopressin	0.4 unit/kg	20 unit/ml	4 unit	0.20	
Other Medications					
Dexmedetomidine Dilution	1 mcg/kg	4 mcg/ml	10 mcg	2.50	Mix 2 ml of Precedex 100 mcg/ml with 48 ml NS = conc 4 mcg/ml
Etomidate	0.2 mg/kg	2 mg/ml	2 mg	1.00	Over 30-60 seconds
Fentanyl	1 mcg/kg	50 mcg/ml	10 mcg	0.20	
Ketamine	1 mg/kg	50 mg/ml	10 mg	0.20	
Midazolam	0.05 mg/kg	1 mg/ml	0.5 mg	0.50	
Rocuronium	1 mg/kg	10 mg/ml	10 mg	1.00	
Vecuronium	0.1 mg/kg	1 mg/ml	1 mg	1.00	

PICU Emergency Medications for Patient Weight ≥ 50 kg

Note: IO dose is same as IV dose

Rev: July 2015

Code Medication Administration Guide

Adenosine *(3 mg/ml)*	First dose: 6 mg = 2 ml IV rapid push Second dose: 12 mg = 4 ml IV rapid push
Amiodarone *(50 mg/ml)*	~~For pulseless VT or VF,~~ initial dose 300 mg = 6 ml IV push. Subsequent dose 150 mg = 3 ml IV push. No dilution required ~~For perfusing rhythm, 150 mg IV over 10 min. Dilute to max 2.5 mg/ml~~
Atropine *(1 mg / 10 ml)*	Initial dose: 1 mg = 10 ml IV, 1-2 mg ETT Max 3 mg total
Calcium Chloride 10% *(1 gram / 10 ml)*	0.5-1 gram = 5-10 ml IV
IV - Epinephrine 1:10,000 *(1 mg / 10 ml)*	Initial dose: 1 mg = 10 ml IV
ETT – Epinephrine 1:1,000 *(1 mg/ml)*	2.5 mg = 2.5 ml via ETT
Glucose 50%	25 gram = 50 ml
Lidocaine 2% *(20 mg/ml)*	Initial dose 1 - 1.5 mg/kg IV up to 100 mg. Double dose for ETT route
Magnesium Sulfate *(500 mg/ml)*	1-2 gram = 2-4 ml given IV over 10-20 min
Naloxone *(0.4 mg/ml)*	0.01 – 0.1 mg/kg up to 2 mg IV/IM/SQ
Sodium Bicarbonate *(1 mEq/ml)*	50 mEq = 50 ml IV
Vasopressin *(20 units/ml)*	40 units = 2 ml IV to replace first or second dose of epinephrine
Other Medications	
Dexmedetomidine *(100 mcg/ml)*	Initial dose: 1 mcg/kg up to 100 mcg IV over 10 min
Etomidate *(2 mg/ml)*	Initial dose 0.2 mg/kg up to 20 mg IV
Fentanyl *(50 mcg/ml)*	50-100 mcg = 1-2 ml IV/IM
Insulin, Regular (*100 unit/ml*)	5 unit = 0.05 ml IV. Give with glucose for hyperkalemia
Ketamine *(50 mg/ml)*	50-100 mg = 1-2 ml IV/IM
Midazolam *(1 mg/ml)*	2-4 mg = 2-4 ml IV/IM
Rocuronium *(10 mg/ml)*	1 mg/kg up to 80 mg IV
Vecuronium *(1 mg/ml) (10 mg vial reconstituted with 10 ml)*	0.1 mg/kg IV up to 10 mg