

Medication Safety and High Alert Medications



SERIOUS MEDICINE. EXTRAORDINARY CARE.™

Objectives

At the completion of this presentation participants should:

1. Be able to identify what a high alert medication is and what medications are considered high alert at Nebraska Medicine (NM)
2. Identify best practice recommendations and organizational safeguards used to reduce risk with high alert medications
3. Understand how to safely evaluate, order and monitor high risk medications
4. Understand the importance of medication warnings and the work being done to evaluate warnings to make existing warnings more meaningful



High Alert Medications

- High-alert medications are those medications that bear a heightened risk of causing significant patient harm when they are used in error
- Nebraska Medicine Pharmacy and Therapeutics Committee identifies medications that require safeguards at any step of the medication management process based on review of internal and external medication error and/or sentinel event data
 - Several strategies and safeguards are instituted to ensure high alert medications are procured, stored, ordered, prepared, dispensed, and administered safely



High Alert Medications

- Strategies and safeguards implemented for high alert medications
 - Use of “High Alert” stickers in applicable storage areas
 - Use of red bins in applicable storage areas
 - Labeling of applicable medications with a “High Alert” sticker when not already labeled as such by the manufacturer
 - High alert medications not stored in a lock lidded pocket must be scanned when removed from the automated dispensing cabinet
 - **Whenever possible, ordering is restricted to order-sets**
 - **When ordering a high alert medication the provider is required to select an appropriate indication**
 - Medications identified as high alert are labeled as such within One Chart
 - Smart infusion pumps with guardrails are used
 - Selected high alert medications require independent dual clinician verification prior to administration



High Alert Medications

- Per organizational policy MM02 High Alert Medications, the following medications and medication classes have been identified as being high alert at Nebraska Medicine
 - Antithrombotics and specific anticoagulant agents
 - Insulin
 - Adrenergic agonists and inotropic agents
 - Anesthetic and sedative agents
 - Neuromuscular blocking agents
 - Chemotherapy and other cytotoxic agents
 - Concentrated electrolyte solutions
 - Parenteral nutrition
 - Prostacyclin analogues
 - Epidural/intrathecal medications and patient controlled analgesia
 - Sodium citrate/calcium infusions for CVVHD
 - Nonformulary infusions



Antithrombotics & Anticoagulant Agents

- Includes abciximab, continuous infusion alteplase, argatroban, bivalirudin, intravenous unfractionated heparin (UFH), and eptifibatide

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Laboratory monitoring (ie. PTT or Hep Quant Assay, CBC)	✓	



Heparin

- UFH for continuous IV infusion should be ordered in a weight based fashion
 - Non weight-based dosing for small and pediatric patients is dangerous!
 - Pharmacokinetics is non-linear: a fixed dose of heparin will not predictably result in a fixed response
 - Non-weight based heparin infusions are allowed for *procedures related to thrombolysis IR or vascular patency*.
 - These infusions must be on a dedicated pump, and the pump must be appropriately labeled.
 - Weight-based dosing of UFH for continuous infusion allows for uniform use of smart pump drug libraries



Heparin

- UFH administered by continuous IV infusion requires laboratory monitoring
 - Anti-Xa assay (heparin quantitative assay; HEPQT) is the “gold standard”. A therapeutic aPTT is defined as one which correlates to a heparin quantitative assay of 0.3-0.7 IU/mL.
 - Anti-Xa assay is less sensitive to some confounders that can affect aPTT (anti-phospholipid antibodies, DIC, congenital coagulation factor deficiency, etc.)
 - Per the Pediatric Quality Committee only HEPQT can be used to monitor pediatric patients on heparin at NM
 - Laboratory monitoring should also include:
 - Baseline aPTT to confirm it is within normal range and rule out potential confounding conditions
 - Platelet count prior to initiation and regularly to detect possible heparin-induced thrombocytopenia (HIT)
 - Hemoglobin



Heparin

- Heparin Protocol (CP RX_16)
 - Developed to support a workflow that enhances safety and minimizes errors
 - Applies to heparin infusions for Acute Coronary Syndrome/Cardiac, VTE/PE, Pediatrics, and Custom orders
 - The pharmacist and nurse will collaborate to ensure appropriate dosing, adjustments and boluses are administered when ordered

Medications

▼ Heparin for Cardiac Indications (NMC)

○ Heparin Infusion for use with Heparin Quantitative Assay

Standard dosage adjustment for Acute Coronary Syndrome.

If follow-up Heparin Assay is	Give additional bolus if ordered	AND change infusion dose, as indicated below
less than 0.2 units/mL	25 units/kg IV	Increase dose by 4 units/kg/hour
0.2 - 0.29 units/mL	none	Increase dose by 2 units/kg/hour
0.3 - 0.7 units/mL	none	No Change - Therapeutic Range
0.71 - 0.79 units/mL	none	Decrease dose by 1 unit/kg/hour
0.8 - 0.89 units/mL	none	Hold heparin for 1 hour, then decrease dose by 2 units/kg/hour
0.9 - 1 units/mL	none	Hold heparin for 1 hour, then decrease dose by 3 units/kg/hour
1.01 - 1.1 units/mL	none	Hold heparin for 2 hour, then decrease dose by 5 units/kg/hour
greater than 1.1 units/mL	none	Hold heparin and call physician, Consider heparin reversal with protamine if patient shows signs of bleeding

Standard initial bolus dose is 60 units/kg to a maximum of 4,000 units.
Maximum initial rate of infusion for ACS is 1,000 units/hour.

heparin (porcine) injection 4,000 Units
 4,000 Units, Intravenous, Once, Today at 1200, For 1 dose, Indications: ACUTE CORONARY SYNDROME
 Dosed at 60 units/kg to a maximum INITIAL bolus dose 4,000 Units per ACS protocol.

heparin in D5W 25,000 units/250 mL (100 units/mL) - Heparin Quant Assay
 5.5-12 Units/kg/hr x 130 kg Dosing weight (7.15-15.6 mL/hr, rounded to 7.2-15.6 mL/hr), Intravenous, Continuous, starting Today at 1200, Indications: ACUTE CORONARY SYNDROME
Dosed per ACS (cardiac indications) heparin protocol. Pharmacist to manage per ACS algorithm Use Heparin Quantitative Assay (HEPQT) for dose adjustments with therapeutic range: 0.3 - 0.7 units/mL. Provider MUST be notified with each dose increase above 30 units/kg/hr.
 Until Discontinued
 Give additional boluses per protocol based on lab values? Yes

Nursing to manage heparin lab per protocol
 Routine, Continuous starting Today at 1115 Until Specified
 Using Nursing Heparin Monitoring order set -Order a Heparin Quantitative Assay (HEPQT) every 6 hours until 2 consecutive measurements are within the goal range, then order a HEPQT for each morning the patient remains within goal range -If infusion is held, order a Heparin Quantitative Assay (HEPQT) to be drawn 6 hours after the infusion is restarted -Order all labs "Per protocol: cosign required"

○ Heparin Infusion for use with PTT (NMC)



Heparin

- When UFH is used per protocol, a provider must be contacted by a pharmacist or nurse in the following situations:
 - When the patient weight is 177.8kg (VTE) or 181.9 kg (ACS) or greater at initiation
 - Heparin quantitative assay results meet/exceed 1.1 units/mL, or the PTT results meet/exceed 200 seconds
 - When the patient shows signs of active bleeding the nurse will contact the provider
 - When infusing doses exceed the soft and/or hard maximum guardrail smart infusion device limit, the pharmacist will notify the provider. This is required for dose increases only



Heparin

- DVT/PE Treatment
 - Achieving therapeutic anticoagulation within 24 hours of starting UFH improves outcomes (recurrent/progressive DVT/PE, death from PE, post-thrombotic syndrome) when treating DVT/PE¹
 - Use of an algorithm that uses weight based heparin dosing + standardized dose adjustments is more likely to achieve therapeutic anticoagulation in the first 24 hours²
 - Exceptions might be necessary for patients with high bleeding risk (thrombocytopenia, additional anti-platelet agents, etc.)

1. Hull et al. Arch Intern Med 1992; 152: 1589

2. Raschke et al. Ann Intern Med 1993; 119: 874



Heparin

- Acute Coronary Syndrome (ACS)
 - Most patients receive additional agents that affect coagulation system (anti-platelet agents, GPIIb/IIIa inhibitors, etc); therefore doses and therapeutic targets are generally **lower** than for PE/DVT
 - Bleeding risks often higher because of concomitant anticoagulants
 - Use of standard doses with nomograms for dose adjustments have not shown to directly affect outcome (survival, recurrent MI, bleeding), but most studies are preceding 'modern' interventions
 - Because most studies using UFH are older, almost all studies used aPTT for monitoring and it is therefore not possible to firmly recommend a particular anti-Xa level for optimal therapy



Heparin

- Custom UFH continuous infusion
 - If the custom heparin protocol is used:
 - The provider must order a discrete dose and indicate an appropriate therapeutic goal based off of Heparin Assay or aPTT. **No custom algorithms will be allowed**
 - When a custom heparin infusion is ordered the provider must be contacted for each lab value outside of the ordered goal

CUSTOM heparin in D5W 25,000 units/250 mL (100 units/mL) - Heparin Quant Assay Accept Cancel

Order Inst.: [To be used with Heparin Quantitative Assay \(Anti-Xa\) laboratory values.](#)

Reference Links: 1. Heparin ACS Protocol 2. Heparin VTE/PE Protocol 3. Link to Lexicomp

Dose: Units/kg/hr

Route: Intravenous Intravenous

Priority: STAT

Frequency: Continuous Continuous

For: Hours Days

Starting: 3/29/2016 Today Tomorrow At: 1230

Starting: Today 1230 Until Discontinued Show Additional Options

Scheduled Times: [Hide Schedule](#)
3/29/16 1230

Admin. Inst.: Insert SmartText

Therapeutic Goal: {Heparin Quant Assay Therapeutic Range:40800001}

Use Heparin Quantitative Assay (HEPQT) for dose adjustments.



Anticoagulant Exclusion Order

- A **“No anticoagulant or antiplatelet medications”** order is available if a provider determines that neither anticoagulant nor antiplatelet medications should be administered to a patient
- The exclusion order is similar to other medication orders, and once ordered will fire an alert to all end-users that attempt to order a medication that has been deemed inappropriate using the exclusion order
- Per policy (MS 66 Anticoagulation Management) the team indicated in the **Service/Team responsible for order** field should be contacted prior to making any changes to the exclusion order

***Exclusion Order: No anticoagulation or antiplatelet medications** ✓ Accept ✗ Cancel

Frequency:

For: Doses Hours Days

Starting: At:

Starting: **Today 1159** **Until Discontinued** Show Additional Options

There are no scheduled times based on the current order parameters.

Questions:

Prompt	Answer
1. Allow aspirin to be administered?	<input type="radio"/> Yes <input checked="" type="radio"/> No
2. Allow prophylactic heparin or prophylactic LMWH to be administered?	<input type="radio"/> Yes <input checked="" type="radio"/> No
3. Allow agents for catheter clearance, catheter locks, and/or arterial lines?	<input type="radio"/> Yes <input checked="" type="radio"/> No
4. Service/Team responsible for order:	<input type="text"/>

Single response:

Indications:

<input type="checkbox"/> ACUTE HEMORRHAGE	<input type="checkbox"/> CEREBROVASCULAR HEMO...	<input type="checkbox"/> SUBDURAL HEMORRHAGE
<input type="checkbox"/> ANTEPARTUM HEMORRHAG...	<input type="checkbox"/> HEMORRHAGIC STROKE	<input type="checkbox"/> Thoracic Surgery
<input type="checkbox"/> AORTIC ANEURYSM WITH D...	<input type="checkbox"/> Head Injury	<input type="checkbox"/> UNCONTROLLED COAGULA...
<input type="checkbox"/> Arterial Hemorrhage	<input type="checkbox"/> INTRACRANIAL BLEEDING	<input type="checkbox"/> Upper GI Bleed
<input type="checkbox"/> BLOOD COAGULATION DISO...	<input type="checkbox"/> POSTSURGICAL COMPLICA...	<input type="checkbox"/> Uterine Rupture in Pregnancy
<input type="checkbox"/> BRAIN ANEURYSM	<input type="checkbox"/> Postoperative Care	<input type="checkbox"/> VASCULAR SURGERY
<input type="checkbox"/> Bleeding due to Clotting Fa...	<input type="checkbox"/> Postsurgical Hemorrhage	
<input type="checkbox"/> CEREBROVASCULAR DISO...	<input type="checkbox"/> SUBARACHNOID HEMORRH...	

Additional clinical indications (300 character max):



Insulin

- Includes insulin formulations

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Hemoglobin A1C within past 90 days	✓	
Point of care glucose	✓	



Barriers to Glycemic Control

1. Low prioritization of glycemic control in hospitalized patients
2. Medical status changes leading to alterations of insulin requirements
 - a. Release of counter-regulatory hormones
 - b. Decrease in insulin requirement
3. Variation of nutritional status
 - a. Changes in caloric intake
 - b. Transitions in the type of nutrition provided
4. Medication effects
 - a. Increased risk for **HYPER**glycemia
 - i. Calcineurins (e.g., tacrolimus, cyclosporine)
 - ii. Catecholamines
 - iii. Corticosteroids
 - b. Increased risk for **HYPO**glycemia
 - i. Insulin
 - ii. Quinolone antibiotics
 - iii. Tapering **OR** Withdrawal of corticosteroids
 - iv. Sulfonylureas
5. Knowledge deficits of healthcare providers



Insulin Background

- Insulin is the **PRIMARY** treatment option for diabetics while they are hospitalized
- Patients admitted to the hospital should have previous oral/non-insulin pharmacotherapy **DISCONTINUED**
- Institutional blood sugar goal for diabetic patients:
 - ❑ 70 – 180 mg/dL
- Consider the BBCs of insulin therapy in **ALL** Type 1 and *most* Type 2 hospitalized diabetic patients:
 - ❑ **B**asal: long acting (insulin glargine) / intermediate acting (NPH)
 - ❑ **B**olus [if eating]: rapid acting (insulin lispro)
 - ❑ **C**orrection scale: rapid acting (insulin lispro)



Hyperglycemia

- **BOTH** over/under treatment of hyperglycemia create safety concerns when considering:
 - ❑ Changes in carbohydrate OR food intake
 - ❑ Changes in clinical status OR medications
 - ❑ Failure to adjust therapy based on blood glucose (BG) patterns
 - ❑ Prolonged use of correction insulin
 - ❑ Poor coordination of BG testing with insulin administration and meal delivery
 - ❑ Poor communication during patient transfers
 - ❑ Errors in placing orders



Joint Commission Requirements Related to Diabetes Management

- Documentation of HbA₁C:
 - ❑ **MUST** be drawn on ALL patients with diabetes if not current within the last 90-days
 - ❑ If available from an outside facility
 - ❖ The result **MUST** be documented in the electronic medical record (EMR)
 - ❑ If not drawn secondary to confounding results (e.g., recent blood transfusion)
 - ❖ The reason **MUST** be documented in the EMR
 - ❑ If the pre-checked box on the “General Subcutaneous Insulin” order set is UNCHECKED
 - ❖ The reason **MUST** be documented in the EMR



Dosing of Insulin

- Decide if the patient needs scheduled basal insulin

Use a basal insulin in patients with known diabetes if. . .	Use a basal insulin in patients with or without a history of diabetes if. . .
<ul style="list-style-type: none"> Type 1 diabetic <u>OR</u> otherwise markedly insulin deficient Patient already requires insulin Poor control despite oral agents 	<ul style="list-style-type: none"> The patient consistently has a fasting blood glucose out of the target range

- When starting insulin in patients, utilize weight-based estimates

If the patient has these features present. . .	Total Daily Dose (TDD) of insulin (units/kg)
Malnourished, elderly (≥ 70 y.o.), CKD (on dialysis), severe liver disease	0.3
Normal-weight patients (including Type 1 diabetics)	0.4
Overweight	0.5
Obese, high dose steroids, or other markers of significant insulin resistance	0.6



Dosing of Insulin Cont.

Nutritional Status	Necessary insulin components	Preferred regimen
<p>NPO</p> <p>OR</p> <p>Clear Liquids</p>	<p><u>Basal insulin</u>: 50% of TDD</p> <p><u>Nutritional insulin</u>: NONE</p>	<p><u>Basal insulin</u>: glargine given once daily</p> <p><u>Nutritional insulin</u>: NONE</p> <p><u>Correction</u>: Rapid-acting/Regular insulin Q6H</p>
<p>Eating Meals</p>	<p><u>Basal insulin</u>: 50% of TDD</p> <p><u>Nutritional Insulin</u>: 50% of TDD divided equally before each meal</p>	<p><u>Basal insulin</u>: glargine given once daily</p> <p><u>Nutritional insulin</u>: rapid-acting analogue (RAA) insulin given with first bite of meal</p> <p><u>Correction</u>: same RAA insulin as nutritional</p>
<p>Continuous Tube Feeds</p> <p>OR</p> <p>Bolus Tube Feeds</p>	<p><u>Basal insulin</u>: 40% of TDD</p> <p><u>Nutritional insulin</u>: 60% of the TDD</p>	<p><u>Basal insulin</u>: glargine given once daily</p> <p><u>Nutritional</u>: RAA insulin Q4H OR regular insulin Q6H</p> <p><u>Correction</u>: same insulin as nutritional</p>

Dosing of Insulin Cont.

- The total daily dose (TDD) of insulin is the daily amount of insulin required for the patient
 - ❑ Encompasses both basal and nutritional needs of the patient
 - ❖ Order half of TDD as basal insulin given at the same time each day
 - ❖ Order the other half of TDD as rapid-acting insulin given in 3 equally divided doses (AC)
- Patients on previous outpatient insulin therapy
 - ❑ **REDUCE** insulin dose by 20 – 25% to prevent inpatient hypoglycemia
- Perioperative patients
 - ❑ Basal insulin should be **REDUCED** by at least 20%



Insulin Pharmacokinetics

	Onset	Peak Effect	Duration of Action
Nutritional/Correction Insulin			
Rapid-acting analog (aspart, glulisine, lispro*)	5 - 15 minutes	1 - 2 hours	4 - 6 hours
Regular*	30 - 60 minutes	2 - 3 hours	6 - 10 hours
Intermediate Insulin			
NPH*	2 - 4 hours	4 - 10 hours	12 - 18 hours
Basal Insulin			
Glargine*	2 - 4 hours	Relatively "peakless"	20 - 24 hours
* = Preferred formulary agent			
Detemir	2 hours	Relatively "peakless"	16 - 24 hours



Transitioning from an Insulin Drip

- Continuous infusion insulin should be transitioned to subcutaneous insulin therapy when the patient begins to eat and blood glucose levels are **STABLE**
 - **TIP:** Guidance on how to transition a patient from continuous infusion insulin to basal insulin can be found in the “General Subcutaneous Insulin” order-set

Instructions for Transitioning from IV Insulin Infusion

Guidelines for transitioning from IV insulin infusion to subcutaneous dosing:

For patients transitioning from an insulin infusion eating well, receiving TPN or tube feeds:

- 1.) Calculate the Total Daily Dose (TDD): Take the average hourly insulin dose in UNITS for the last 12 hours and multiply by 24 hours.
- 2.) Calculate **60-80%** of TDD and deliver **50%** as glargine and **50%** as lispro with meals (AC).
- 3.) Order Correction Insulin based on TDD.
- 4.) The **first** dose of glargine should be given **two hours prior** to discontinuing the insulin infusion.

For patients transitioning from an insulin infusion NPO or not eating well:

- 1.) Calculate the Total Daily Dose (TDD): Take the average hourly insulin dose in UNITS for the last 12 hours and multiply by 24 hours.
- 2.) Calculate **50%** of TDD and deliver **50%** as glargine and **50%** as lispro with meals (AC).
- 3.) Order Correction Insulin based on TDD.
- 4.) The **first** dose of glargine should be given **two hours prior** to discontinuing the insulin infusion.

Reference:
Avazi, F., Giuseppe, M., Walter, D. (2011). Transition from Intravenous to Subcutaneous Insulin. *Diabetes Care*, 1445-1450.



Transitioning from an Insulin Drip Cont.

- Subcutaneous **BASAL** insulin should be administered at least 1-2 hours **PRIOR** to discontinuing the infusion
- To ensure the insulin infusion is discontinued at the appropriate time
 - ❑ **TIP:** Utilize the inpatient consult to pharmacist order located in the “General Subcutaneous Insulin” order-set

- insulin glargine (LANTUS) injection
 - insulin glargine (LANTUS) injection
Subcutaneous, Daily, Basal glargine insulin should be administered even if patient is temporarily NPO or has temporary interruption in nutrition.
 - insulin glargine (LANTUS) injection
Subcutaneous, Nightly, Basal glargine insulin should be administered even if patient is temporarily NPO or has temporary interruption in nutrition.
- Inpatient consult to pharmacist - Discontinue insulin infusion after administration of basal subQ insulin

- Order correction insulin based on the total daily dose (TDD) of insulin needed by the patient
 - ❑ **Level 1:** < 40 units/day
 - ❑ **Level 2:** 40-80 units/day
 - ❑ **Level 3:** > 80 units/day



Example Transition from an Insulin Drip

Step 1: Establish the 24-hour insulin requirement by extrapolating from the average IV insulin dose required over the previous 6-8 hours (if stable)

- **Example:** Patient has been receiving 4 units/hr for the past 8 hours
 - TDD of insulin = 3 units/hr X 8 hours X 3 = 72 units of insulin/day

Step 2: Take 60-80% of the extrapolated total daily insulin dose (TDD) calculated in step 1 above → 72 units of insulin/day X 0.75 = 54 units of insulin/day

- Give one-half as **long-acting** insulin preparation for basal coverage
 - ❖ 72 units X 0.5 = 27 units of glargine daily
- Give the other half as **rapid-acting insulin divided by 3** for meal coverage doses
 - ❖ 27 units of lispro ÷ 3 = 9 units of lispro AC

Step 3: Order correction insulin based upon the TDD of insulin needed

- ❑ Level 1: < 40 units/day
- ❑ Level 2: 40-80 units/day
- ❑ Level 3: > 80 units/day



Insulin Administration with Parenteral and Enteral Nutrition

- Patients receiving concurrent insulin therapy are at risk for hypoglycemia anytime therapy is interrupted
- Extended interruptions should be reviewed carefully to ensure an appropriate insulin regimen is ordered



Non-formulary Insulin Products

- **NOT ALLOWED** for the treatment of inpatients
- Pose a significant patient safety issue as outlined in “High Alert Medication Management” policy [MM02]
- Such products include:
 - ❑ Toujeo[®] (insulin glargine U-300)
 - ❑ Humalog[®] U-200 (insulin lispro)
 - ❑ Tresiba[®] (insulin degludec U-100, U-200)
 - ❑ Regular U-500
 - ❑ V-Go[®] insulin delivery devices



Insulin Pumps

- When an insulin pump is continued in the inpatient setting
 - ❑ **FOLLOW** the “Guidelines for Patient’s own Subcutaneous Insulin Pump” policy [MP 03]
 - ❖ NM Campus: Endocrinology and Inpatient Diabetes Education Services **MUST** be consulted
 - ❖ BMC Campus: The primary ordering provider is responsible for insulin pump orders **OR** an alternative insulin regime. Inpatient Diabetes Services are also available.



Insulin for the Treatment of Hyperkalemia

- The “Hyperkalemia Treatment (insulin)” order panel should **ALWAYS** be utilized

Name	Type	Dose	Route	Frequ	Pref List	Code
Hyperkalemia Treatment (insulin)	Order P				TNMC IP I	
insulin (HUMAN R) in dextrose 50 % infusion	Medical				NMC IP MI	
insulin (HUMAN R) infusion - Adult DKA	Medical				NMC IP MI	
insulin (HUMAN R) infusion - Adult HHS	Medical				NMC IP MI	
insulin (HUMAN R) infusion (PEDS)	Medical				NMC IP MI	
insulin (HUMAN R) infusion, custom	Medical				NMC IP MI	



Adrenergic Agonists & Inotropic Agents

- Includes DOBUTamine, DOPamine, EPINEPHrine, Isoproterenol, Milrinone, Norepinephrine, Phenylephrine, Vasopressin

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring: Heart rate, blood pressure, SP02, and ECG monitoring	✓	



Adrenergic Agonists & Inotropic Agents

- When titration for a medication is necessary
 - A range dose should always be used
 - Administration instruction must provide guidance on how the nurse should titrate

EPINEPHrine HCl in 0.9 % NaCl 4 mg/250 mL (16 mcg/mL) continuous infusion Accept Cancel

Reference Links: 1. [Link to Lexicomp](#)

Dose: mcg/min 1-8 mcg/min 1 mcg/min 2 mcg/min 4 mcg/min 8 mcg/min

Administer Dose: **1-8 mcg/min**

Concentration: mcg/mL 16 mcg/mL 32 mcg/mL 64 mcg/mL
3.8-30 mL/hr 1.9-15 mL/hr 0.9-7.5 mL/hr

Route: Intravenous

Priority: STAT

Frequency: Continuous

For: Hours Days

Starting: Today Tomorrow At:

Starting: **Today 1100** **Until Discontinued** [Show Additional Options](#)

Scheduled Times: [Hide Schedule](#)

Admin. Inst.:



Adrenergic Agonists & Inotropic Agents

- When a fixed dose for a medication is necessary
 - A range dose should not be used
 - Administration instructions should not contain titration information

EPINEPHrine HCl in 0.9 % NaCl 4 mg/250 mL (16 mcg/mL) continuous infusion ✓ Accept ✗ Cancel

Reference Links: 1. [Link to Lexicomp](#)

Dose: mcg/min 1-8 mcg/min 1 mcg/min 2 mcg/min 4 mcg/min 8 mcg/min

Administer Dose: 2 mcg/min

Concentration: mcg/mL 16 mcg/mL 32 mcg/mL 64 mcg/mL
7.5 mL/hr 3.8 mL/hr 1.9 mL/hr

Route: Intravenous

Priority: STAT

Frequency: Continuous

For: Hours Days

Starting: Today Tomorrow At:

Starting: **Today 1100** **Until Discontinued** Show Additional Options

Scheduled Times: [Hide Schedule](#)

Admin. Inst.: Insert SmartText



Anesthetic & Sedative Agents

- Includes dexmedetomidine, etomidate, ketamine, methohexital, midazolam, propofol
- Must be ordered and administered in accordance with MS15 Sedation and Analgesia Administration Guidelines

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Heart rate, blood pressure, SP02, and ECG monitoring	✓	
Special monitoring for sedation (i.e. goal sedation score)	✓	



Anesthetic & Sedative Agents

- Special Monitoring for Sedation
 - Titrations must be directed by an objective sedation or analgesic goal set by the provider
 - Unless indicated by the provider:
 - Sedation regimens will be titrated to a standard goal Richmond Agitation-Sedation Score (RASS) of -2 to 0
 - Ordered analgesic regimens will be titrated to a standard goal pain score of Critical-Care Pain Observation Tool (CPOT) <3 or Behavioral Pain Scale (BPS) <5
 - Patients must have spontaneous awakening trial daily, unless contraindicated/precluded by the awakening safety screen indicated in the ABCDE bundle



Neuromuscular Blocking Agents (NMB's)

- Includes cisatracurium, rocuronium, succinylcholine, vecuronium

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Heart rate, blood pressure, SP02, and ECG monitoring	✓	
Special monitoring – When intended for prolonged use, an objective measurement of neuromuscular blockade must be used (i.e. train of four) and an objective measurement of sedation (i.e. BIS) must be used	✓	



Chemotherapy & Other Cytotoxic Agents

- Chemotherapy orders must be signed by an attending physician and verified by two pharmacists

Safeguards that Impact Providers	Yes	No
Available concentrations are limited		x
Order-sets, treatment plans, or therapy plans should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Dependent on the chemotherapy regimen ordered	✓	



Chemotherapy & Other Cytotoxic Agents

- When placing orders using treatment or therapy plans, to prevent errors always consider the following:
 - Review height, weight, & BSA, and update if needed
 - When propagating orders ensure the dose is correct and that the order has not been discontinued
 - If a patient is instructed to discontinue a specific therapy, always discontinue the order in the treatment plan. If this is not done, errors can occur when the patient is seen at a later date for a different reason
 - Review labs and update treatment plans based on lab results
 - Remove default lab parameters in treatment plans when they are inappropriate



Concentrated Electrolyte Solutions

- Includes calcium gluconate vials, magnesium sulfate vials, potassium chloride vials, calcium chloride vials, magnesium 40 g/500 mL, sodium chloride greater than 0.9% (hypertonic saline)
- Standardized orders for single electrolyte bolus doses will be available for selection during order entry
- Hypertonic saline
 - Order sets are in development and will be utilized to enter hypertonic saline orders
 - Pharmacists can order a serum sodium level 6 hours after administration of hypertonic saline to monitor for efficacy/toxicity



Parenteral Nutrition (PN)

- All PN orders expire 24 hours following initiation, and new orders must be placed each day
- A nutrition therapist must be consulted for all patients on PN

Safeguards that Impact Providers	Yes	No
Available concentrations are limited		x
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Intake/Output recorded every 8 hours	✓	
Periodic assessment of electrolytes (BMP, Mg, Phos)	✓	
Point of care glucose testing should be considered	✓	



Prostacyclin Analogues

- Includes intravenous epoprostenol and treprostinil
- A Pulmonary Medicine or Cardiology service must be consulted to manage therapy
- For initiation of therapy the patient must be admitted to an ICU as outlined in MS68 Levels of Care
- Patients that require hospitalization that are currently receiving chronic prostacyclin analogue therapy or are deemed stable following initiation may be admitted to the Adult Progressive Care Unit (APCU)

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Heart rate, blood pressure, respiratory rate, and SPO2 must be monitored with each dosing change	✓	
ECG monitoring	✓	



Epidural/Intrathecal Medications & Patient Controlled Analgesia (PCA)

- Only providers from Anesthesiology and Acute/Chronic Pain Service may administer epidural loading doses and bolus doses
 - The provider must work with nursing staff to ensure the administration is documented in the MAR

Safeguards that Impact Providers	Yes	No
Available concentrations are limited	✓	
Order-sets should be used when placing orders	✓	
Administration/monitoring instructions should be reviewed & defined by provider at the time of order entry	✓	
Required monitoring		
Continuous oximetry monitoring	✓	
Special monitoring identified within order-sets	✓	



Medication Administration



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Medication Administration

- According to policy MS08 Administration of Parenteral Medications, licensed prescribers must have proficient knowledge of the following before administering a medication to a patient:
 - Dose
 - Administration technique
 - Potential adverse effects
 - Monitoring guidelines



Medication Administration

- Organization drug information resources (i.e. Lexicomp) are available on the Preceptor home page via the Drug Information link

The screenshot displays the SYNAPSE website interface. On the left, a red navigation menu lists various resources, including 'Drug Information'. A red arrow points from this menu item to the 'Drug Information' section of the main content area. In this section, the 'Lexicomp' link is highlighted in red. Below the main content area, there are several other links: 'Clinical Pharmacology', 'Natural Medicines', and 'NeoFax'. The top of the page features a header with the SYNAPSE logo and several navigation links: 'Nursing Homepage', 'Nebraska Medicine Intranet', 'Useful Links', 'Pharmacy & Nutrition Homepage', 'UNMC Intranet', and 'UNMC Physicians'. The date 'Tuesday, April 26, 2016' is also visible. The main content area includes a 'Current News!' section and a 'Lexicomp' section with a brief description: 'This reference provides information regarding t as related policies. In addition, this is a general reactions/contraindications, interactions, clinical'. The bottom right corner features a red logo with a stylized 'N'.

Medication Administration

- Prior to administering a medication the following should be verified:
 - The medication matches the order and product label
 - There is no loss of medication integrity
 - The medication is not expired
 - No contraindications exist
 - The correct medication is being administered at the proper time, in the prescribed dose, by the ordered route, and to the correct patient
 - Barcode medication administration (BCMA) is used if available
 - Unresolved concerns about the medication are discussed with the patient and/or appropriate providers
 - The patient and/or family are informed of any potential significant adverse drug reactions or other concerns



One Chart Medication Warnings



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One Chart Medication Warnings

- Alert end users of issues related to:
 - Allergies
 - Drug interactions
 - Duplicate therapy
 - Other potential medication issues
- Important for all individuals ordering medications to review medication warnings carefully
- For medication warnings to be effective, it is important to minimize alert fatigue by ensuring medication warnings are appropriate and meaningful



One Chart Medication Warnings

- Medication Safety Team and One Chart analyst run medication warning data every 3-6 months
- The following are reviewed quarterly by multiple groups and committees that include both pharmacists and physicians:
 - Most common medication warnings
 - Other opportunities related to warnings
 - Special requests related to warnings
- Recommendations are reviewed and approved by the P&T Steering Committee prior to changes being made in One Chart

