MUNSON MEDICAL CENTER
MUNSON HEALTHCARE

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PHARMACY & THERAPEUTICS COMMITTEE

Meeting Minutes
December 1, 2025

Medical Staff:

☒ *Emily Dryer, DO P&T Chair* ☐ *William Britton, MD* ☐ *Christopher LaFond, MD* ☒ *Ryan Miller, DO*
☐ *Todd Adams, DO* ☐ *Kelly Clark, MD* ☐ *Jordyn Emery, PGY2 FP Resident* ☐ *Haley Kopkua, MD*
☐ *Jordyn Emery, PGY3*

Hospital Staff:

☐ *Butch Bowlby, RPh, MSA* ☐ *Aimee Cloud, PharmD BCOP* ☒ *Wendy Hunt, RN* ☒ *Alisa Siebenmorgan, PGY1*
☒ *Cathi Cornelius, PharmD* ☐ *Jeff Durkin, RPh* ☐ *DeAnne Mosher, RN* ☐ Kaitlyn Sutliff, *PGY1*
☐ *Emily Warner, PharmD* ☒ *Brad Beaman, PharmD* ☐ *Samantha Smith, RN* ☐ *Cayman Dulz, PGY1*
☒ *Heather Tolfree, PharmD* ☒ *Nick Torney, PharmD* ☒ *Heidi Swensson, Sr Clinical Informaticist* ☒ *Chris Geetings, RN*
☒ *Trevor Warner, PharmD*

Guests:

AGENDA ITEM	DISCUSSION	ACTION / CONCLUSION / RECOMMENDATION	RESPONSIBLE PARTY
Call to Order	Called the meeting was called to order at 12:17pm		
A. Welcome: Additions/ Corrections to Agenda	Thank you to Dr Dryer for her years of support as MMC P&T Chairperson. Starting in January Dr. Miller will become our new chairperson.		
B. P&T Minutes	Members were asked to approve the MMC P&T Committee meeting minutes from November 2025 (link)	Approved, Motion by E Dryer. Second by T Warner. All attendees in favor.	
C. Ancillary Meeting Minutes	1. MMC P&T Subcommittee: 11/13/2025 (link) 2. MHC System P&T Meeting Minutes: 11/2025 (link)	Informational	
D. Consent Agenda Policies/Items	MMC P&T Policy and PowerPlans - New and Updated: 1. Pre-Admission Anesthesia Protocol – Medication Instructions for Surgical Patients – 3-year review (attached) 2. VTE for Trauma PowerPlan – new (attached) 3. Pediatric Central Line Bundle PowerPlan – new (attached) 4. Nitrous Oxide Use in OB Policy – new (attached) 5. ED Postpartum Hypertension – new (attached)	1. H Tolfree motion, E Dryer second – Approved 2. T Warner motion, H Tolfree second – Approved 3. H Tolfree motion, B Beaman second – Approved 4. H Tolfree motion, B Beaman second – Approved 5. Approved at System P&T	H Tolfree
New/Old Business			
E. SubQ Insulin for Mild DKA (attached)	C Cornelius presented the reference text, protocol and PowerPlan for the use of SQ insulin for mild DKA	Informational – Approved at System P&T	C Cornelius
F. Tenecteplase FMEA (attached)	T Warner presented the results of this FMEA.	Informational – Approved at System P&T	T Warner
G. Remdesivir VS Paxlovid MUE (attached)	A Siebenmorgan presenter the MUE	Informational – Approved at System P&T	A Siebenmorgan
Formulary Changes			
H. Myrbetriq (attached)	C Cornelius presented the formulary decision at from System P&T	MMC P&T voted to add to formulary C Cornelius motion, B Beaman Second	C Cornelius
I. CiproDex Otic (attached)	C Cornelius presented the formulary decision at from System P&T	MMC P&T voted to add to formulary C Cornelius motion, B Beaman Second	C Cornelius
Marketplace Status			
M. Drugs Shortages (attached)	Educational Purposes only; no actions necessary		B Beaman
N. Drug Recalls			
Periodic Reports			
O. Pharmacist Interventions (attached)	Kudos to those staff on the top 10 list!	For informational purposes only.	H Tolfree

Next Meeting: The next meeting is scheduled for 1/5/2026 via Microsoft Teams and in person in Dining Room 2.

Meeting adjourned at 1300

Status Pending PolicyStat ID 19116424

Origination	4/1/2024
Last Approved	N/A
Effective	10/16/2025
Last Revised	10/15/2025
Next Review	3 years after approval

Owner	Amanda Chappel: Mgr Nursing Services
Area/ Department	Surgical Services - Pre-Procedure Services
Applicability	MMC

Pre-Admission Anesthesia Protocol: Medication Instructions for Surgical Patients

Purpose

This protocol allows a Registered Nurse (RN) to provide preoperative instruction to patients on which medications to continue and discontinue prior to surgery.

Protocol

A. The RN will obtain current patient medications and instruct the patient on medications to be taken the day of surgery and identify medications to be discontinued prior to surgery.

B. Patients should be instructed to take medications on the day of surgery as follows, unless instructed otherwise by their cardiologist, primary care provider, or surgeon.

As per Primary Care Provider, Cardiology or Surgeon

Medication Category	Additional Information
Anticoagulant or antiplatelet	If taking aspirin for heart stents or therapeutic prescription prescribed for cardiovascular disease, take aspirin on day of surgery (notify surgeon).
Biologics [ex: Intravenous immunoglobulin (IVIG), blood products, growth factors, monoclonal antibodies, immune modulators]	
Chemotherapy	
Oral Contraceptives Postmenopausal hormone therapy Selective estrogen receptor modulators	Evaluate risk of thromboembolism
Any medication not included on this list	

Continue Taking / Take Day of Surgery

Medication Category	Additional Information
Alpha-1 antagonists for hypertension or benign prostatic hypertrophy	
Anticonvulsants	
Antidepressants (other than monoamine-oxidase inhibitors), anti-psychotics, antianxiety agents, and mood stabilizers	Unless instructed otherwise by provider
Antihypertensives [other than Angiotensin-converting-enzyme inhibitors (ACEI), Angiotensin Receptor blockers (ARBs), and diuretics] and other cardiovascular medications	Patient is to take Beta Blockers within 24 hours of surgery. If takes in evening, please document instructions to take night prior.
Antimicrobials (antibiotics, antifungals, antivirals)	
Benzodiazepines	
Dopamine agonists (Parkinson's medication)	
Gastric acid suppressants H2 Blockers and Proton Pump Inhibitors	
Inhalers and nebulized therapies	
Leukotriene inhibitors	Instruct patient to bring inhaler day of surgery
Oral/ sublingual Medication for Opioid Use Disorder (MOUD) buprenorphine +/- naloxone (Subutex, Suboxone)	It is recommended to continue these medications through the surgical period for optimal pain control AND relapse prevention. If taking greater than 16 mg/day, check with your prescriber for tapering to 16 mg/day max dose prior to surgery.
Pain medication [except Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)] such as: • Opioid • Opioid agonist • Opioid antagonist/ mixed	
Potassium (prescription only)	Stop if diuretic is stopped
Statins	
Steroids	
Thyroid replacement	

Do Not Take Day of Surgery

Medication Category	Additional Information
ACEI	Cataract patients scheduled for Monitored Anesthesia Care (MAC) should take
ARBs	
Bisphosphonates	
Diuretics (not combined with other antihypertensives)	
Insulin	Instruct patient to bring

Medication Category	Additional Information
Non-Statin hyperlipidemic agents Niacin and fibric acid derivatives (gemfibrozil, fenofibrate) Bile sequestrants (cholestyramine and colestipol) Ezetimibe	
Oral diabetic medications, except for Sodium-Glucose Transporter-2 Inhibitors (SGLT-2) (see below)	
Psycho-stimulants (methylphenidate and other amphetamines)	
Renin Inhibitors	

Stop 24 Hours Before Surgery

Medication Category	Additional Information
Naltrexone - Oral	
Sildenafil (Viagra)	Assess indication. If used for Pulmonary Arterial Hypertension, contact prescriber.

Stop 72 Hours Before Surgery

Medication Category	Additional Information
SGLT-2 for any indication	
Tadalafil (Cialis)	Assess indication. If used for Pulmonary Arterial Hypertension, contact prescriber.

Stop 7 Days Before Surgery

Medication Category	Additional Information
Glucagon Like Peptide-1 (GLP-1) agonists (oral or injectable) for weight loss or diabetes	• For patients on daily or twice daily dosing stop 24 hours before surgery • For patients on weekly dosing – Hold medication a week prior to surgery. If unable to stop 7 days prior, patient must be clear liquids for 24hrs prior to surgery. Clear liquids should be stopped per the Pre-Procedure Nothing By Mouth Policy (ID: 14063800).

Stop 10 Days Before Surgery

Medication Category	Additional Information
NSAIDs	

Stop 14 Days Before Surgery

Medication Category	Additional Information
Diet medications other that GLP-1 agonists	
Monoamine Oxidase Inhibitors (MAOIs)	Stop 14 days pre-op unless psychiatrist states in writing they cannot be safely withdrawn
Vitamins and herbal products	

Stop at Least 28 Days Before Surgery

Medication Category	Additional Information
Naltrexone – Intramuscular	Stop at least 28 days prior to planned surgery. May bridge with oral naltrexone if stopping greater than 28 days before known procedure, which should stop ~24 hours before surgery

References

1. Abdelmalak, B. & Sreedharan, R. (2023). Anesthesia for patients with diabetes mellitus and/ or hyperglycemia.UpToDate. Retrieved November 9, 2023, from https://www.uptodate.com/contents/anesthesia-for-patients-with-diabetes-mellitus-and-or-hyperglycemia?sectionName=Medication%20regimen&search=medication%20use%20prior%20to%20surgery&topicRef=1753&anchor=H2283226405&source=see_link#H2283226405
2. Muluk, V., Cohn, S.L., & Whinney, C. (2023). Perioperative medical management. UpToDate. Retrieved October 26, 2023, from https://www.uptodate.com/contents/perioperative-medication-management?search=preoperative%20medication%20management&source=search_result&selectedTitle=1~87&usage_type=default&display_rank=1#H48
3. Oprea, A. D., Keshock, M. C., O'Glasser, A. Y., Cummings, K. C., Edwards, A. F., Zimbrean, P. C., ... & Mauck, K. F. (2022). Preoperative management of medications for psychiatric diseases: Society for Perioperative Assessment and Quality Improvement Consensus Statement. *Mayo Clinic Proceedings*, *97*(2), 397–416. https://doi.org/10.1016/j.mayocp.2021.11.011

Approved by P&T 2/5/2024

Approval Signatures

Step Description	Approver	Date
P&T Committee	Heather Tolfree: Mgr Pharmacy - CPS	Pending
Dir Nursing Surgical Services	Amy Verburg: Dir Surgical Services	10/16/2025
Document Owner	Amanda Chappel: Mgr Nursing Services	10/15/2025

Applicability

Munson Medical Center

Standards

No standards are associated with this document

Unique Plan Description: VTE for Trauma
Available at: ***MMC***

VTE for Trauma
Non Categorized

CrCl/Weight	Weight ≥ 100kg	Weight <100kg
CrCl ≥60	Enoxaparin 0.5mg/kg Subcut Q12 hours	Enoxaparin 40mg Subcut Q12 hours
CrCl 30-59	Enoxaparin 0.5mg/kg Subcut Q12 hours	Enoxaparin 30mg Subcut Q12 hours
CrCl <30	Heparin 5000 units Subcut Q8 hours	Heparin 5000 units Subcut Q8 hours

(NOTE)*

Medications

Weight GREATER than or equal to 100kg (NOTE)*

CrCl greater than or equal to 60(NOTE)*

☐ Lovenox

Indication: VTE Prophylaxis, 0.5 mg/kg, Subcut, Inject, q12hr, Routine
Comments: Preferred in patients with CrCl greater than or equal to 60 ml/min, Weight greater than or equal to 100 kg. (round to the nearest syringe size)

CrCl 30-59(NOTE)*

☐ Lovenox

Indication: VTE Prophylaxis, 0.5 mg/kg, Subcut, Inject, q12hr, Routine
Comments: Preferred in patients with CrCl 30 - 59 ml/min, Weight greater than or equal to 100 kg. (Round to the nearest syringe size)

CrCl less than 30(NOTE)*

☐ Heparin SUBCUT

5,000 unit, Subcut, Inject, q8hr, Routine
Comments: Indication: VTE Prophylaxis. Preferred in patients with CrCl less than 30ml/min, Weight greater than or equal to 100 kg.

Weight LESS than 100kg (NOTE)*

CrCl greater than or equal to 60(NOTE)*

☐ Lovenox

Indication: VTE Prophylaxis, 40 mg, Subcut, Inject, q12hr, Routine
Comments: Preferred in patients with CrCl greater than or equal to 60 ml/min, Weight less than 100 kg.

CrCl 30-59(NOTE)*

☐ Lovenox

Indication: VTE Prophylaxis, 30 mg, Subcut, Inject, q12hr, Routine
Comments: Preferred in patients with CrCl 30 - 59 ml/min, Weight less than 100 kg.

CrCl less than 30(NOTE)*

☐ Heparin SUBCUT

5,000 unit, Subcut, Inject, q8hr, Routine
Comments: Indication: VTE Prophylaxis. Preferred in patients with CrCl less than 30ml/min, Weight less than 100 kg.

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☐ Last Plan Review Date

Commented [WE1]: greater than or equal to

Commented [WE2]: greater than or equal to


VTE for Trauma (Initiated Pending)
Non Categorized
CrCl/Weight
Weight ≥ 100kg
Weight <100kg
CrCl ≥60
Enoxaparin 0.5mg/kg Subcut Q12 hours
Enoxaparin 40mg Subcut Q12 hours
CrCl 30-59
Enoxaparin 0.5mg/kg Subcut Q12 hours
Enoxaparin 30mg Subcut Q12 hours
CrCl <30
Heparin 5000 units Subcut Q8 hours
Heparin 5000 units Subcut Q8 hours
Medications
Weight GREATER than or equal to 100kg
CrCl greater than 60
enoxaparin (Lovenox)
Indication: VTE Prophylaxis, 0.5 mg/kg, Subcut, Inject, q12hr, Routine
Preferred in patients with CrCl greater than or equal to 60 ml/min, Weight greater than or equal to 100 kg.
CrCl 30-59
enoxaparin (Lovenox)
Indication: VTE Prophylaxis, 0.5 mg/kg, Subcut, Inject, q12hr, Routine
Preferred in patients with CrCl 30 - 59 ml/min, Weight greater than or equal to 100 kg.
CrCl less than 30
heparin (Heparin SUBCUT)
5,000 unit, Subcut, Inject, q8hr, Routine
Indication: VTE Prophylaxis. Preferred in patients with CrCl less than 30ml/min, Weight greater than or equal to 100 kg.
Weight LESS than 100kg
CrCl greater than 60
enoxaparin (Lovenox)
Indication: VTE Prophylaxis, 40 mg, Subcut, Inject, q12hr, Routine
Preferred in patients with CrCl greater than or equal to 60 ml/min, Weight less than 100 kg.
CrCl 30-59
enoxaparin (Lovenox)
Indication: VTE Prophylaxis, 30 mg, Subcut, Inject, q12hr, Routine
Preferred in patients with CrCl 30 - 59 ml/min, Weight less than 100 kg.
CrCl less than 30
heparin (Heparin SUBCUT)
5,000 unit, Subcut, Inject, q8hr, Routine
Indication: VTE Prophylaxis. Preferred in patients with CrCl less than 30ml/min, Weight less than 100 kg.

Unique Plan Description: PEDS Central Line Bundle
Available at: ***MMC***

PEDS Central Line Bundle
Patient Care

**NOTE: Includes tunneled Powerlines(NOTE)*

☑ Soap and Water Bath - Chin to Toe Task
Daily, Give Soap and Water bath until Central Line has been removed, chin to toe bath. Change bed linens with bath.

☐ Chlorhexidine Bath - Chin to Toe Task
*Daily, Give chlorhexidine bath with wipes, continue until the Central Line has been removed, chin to toe bath. *If patient has a CHG allergy, please order Soap and Water Bath. Change bed linens with bath.*

Central Line

☑ Central Line Monitoring (nsg)
q12hr, & PRN - SINGLE LUMEN - Flush to maintain patency of the catheter and prevent mixing of incompatible medications or solutions. Use ~~10~~ 5 mL 0.9% Sodium Chloride Preservative Free (DEF)*
Comments: Vigorous pulsing flush with ~~10mL~~ 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.
q12hr, & PRN - 2 LUMEN - Flush to maintain patency of the catheter and prevent mixing of incompatible medications or solutions Use ~~10~~ 5 mL 0.9% Sodium Chloride Preservative Free for each lumen
Comments: Vigorous pulsing flush with ~~10mL~~ 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.
q12hr, & PRN - 3 LUMEN - Flush to maintain patency of the catheter and prevent mixing of incompatible medications or solutions. Use ~~10~~ 5 mL 0.9% Sodium Chloride Preservative Free for each lumen
Comments: Vigorous pulsing flush with ~~10mL~~ 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.
q12hr, & PRN - 4 LUMEN - Flush to maintain patency of the catheter and prevent mixing of incompatible medications or solutions Use ~~10~~ 5 mL 0.9% Sodium Chloride Preservative Free for each lumen
Comments: Vigorous pulsing flush with ~~10mL~~ 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.

Medications

☑ Sodium Chloride 0.9% Pres. Free FLUSH
5 mL, IVPush, Inject, q12hSTD
Comments: PEDS Central Line Flush - ~~Use to flush each site with 10ml syringe per standard.~~ See unscheduled med. Vigorous pulsing flush with 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.

☑ Sodium Chloride 0.9% Pres. Free FLUSH
5 mL, IVPush, Inject, PRN, PRN Flush
Comments: PEDS Central Line Flush - ~~Use to flush each site with 10ml syringe per standard~~. See scheduled med. Vigorous pulsing flush with 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflow of blood into the line. The backflow of blood can result in clot formation, line occlusion, and blood stream infection.

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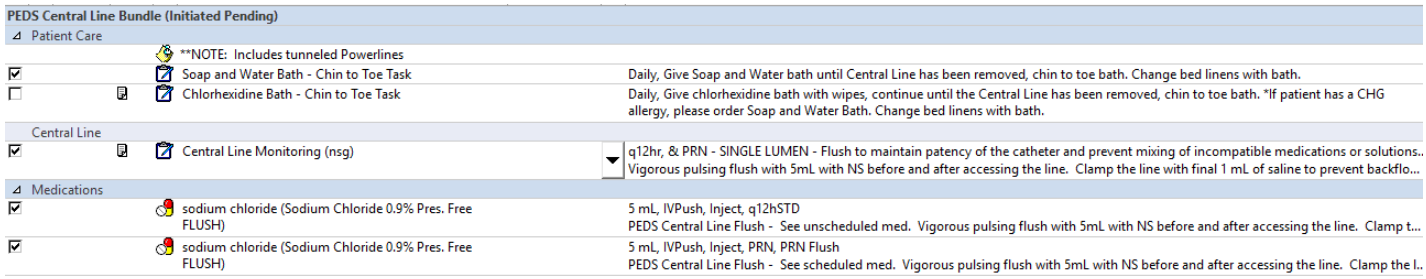
☐ Last Plan Review Date



PEDS Central Line Bundle (Initiated Pending)		
Patient Care		
	**NOTE: Includes tunneled Powerlines	
☑	Soap and Water Bath - Chin to Toe Task	Daily, Give Soap and Water bath until Central Line has been removed, chin to toe bath. Change bed linens with bath.
☐	Chlorhexidine Bath - Chin to Toe Task	Daily, Give chlorhexidine bath with wipes, continue until the Central Line has been removed, chin to toe bath. *If patient has a CHG allergy, please order Soap and Water Bath. Change bed linens with bath.
Central Line		
☑	Central Line Monitoring (nsg)	q12hr, & PRN - SINGLE LUMEN - Flush to maintain patency of the catheter and prevent mixing of incompatible medications or solutions.. Vigorous pulsing flush with 5mL with NS before and after accessing the line. Clamp the line with final 1 mL of saline to prevent backflo...
Medications		
☑	sodium chloride (Sodium Chloride 0.9% Pres. Free FLUSH)	5 mL, IVPush, Inject, q12hSTD PEDS Central Line Flush - See unscheduled med. Vigorous pulsing flush with 5mL with NS before and after accessing the line. Clamp t...
☑	sodium chloride (Sodium Chloride 0.9% Pres. Free FLUSH)	5 mL, IVPush, Inject, PRN, PRN Flush PEDS Central Line Flush - See scheduled med. Vigorous pulsing flush with 5mL with NS before and after accessing the line. Clamp the l..

Status **Pending** PolicyStat ID **19223638**

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Origination	N/A
Last Approved	N/A
Effective	Upon Approval
Last Revised	N/A
Next Review	3 years after approval

Owner	Lori Barnes: Mgr Nursing Services
Area/ Department	Women & Children Services
Applicability	MMC, Cadillac
Tags	Guideline

Nitrous Oxide Use in the Antepartum, Intrapartum, and Immediate Post Partum Setting

Purpose

Guidelines to provide mild analgesia via a self-administered inhaled nitrous oxide delivery system for women in the antepartum/intrapartum/immediate postpartum period. The use of nitrous oxide as an analgesic is standardized according to current national practices and guidelines to provide safe, consistent administration for women who desire such and are appropriate candidates.

Responsibility

A. Nursing staff

B. Obstetrics (OB) providers

Guidelines

A. Use of nitrous oxide may be initiated in any of the following clinical settings:

- Analgesia and anxiolytic for first, second, and third stages of labor
- Placement of cervical dilator
- Patient desire for less invasive method of labor analgesia
- Contraindications to neuraxial procedures (spinal/epidural mass, spinal malformation, localized infection, allergy to local anesthetics, hematological disorder)
- Intrauterine fetal demise (IUFD) (bedside Dilatation and Curettage [D&C])

- Intravenous (IV) Starts
- Manual removal of the placenta
- Forceps or vacuum assisted deliveries
- Perineal/vaginal repair
- Difficult vaginal exam
- External cephalic version
- Hemolysis, elevated liver enzyme, and low platelet levels (HELLP) syndrome
- Advanced labor precluding availability of regional analgesia or while awaiting initiation of regional analgesia

B. Contraindications for nitrous oxide use are if patient exhibits or has any of the following:
    - Inability to physically hold their own face mask
    - Intoxicated or has impaired consciousness
    - History of pernicious anemia, alcohol abuse, documented vitamin B12 deficiency, gastric bypass, Crohn's or Celiac disease, strict vegan or vegetarian diet, history of anorexia nervosa UNLESS there is a documented normal B12 level within 30 days of admission for labor
    - ANY opioid administration within the last 2 hours (i.e. Fentanyl, Nubain etc.)
    - History of Emphysema or Pulmonary Hypertension
    - History of increased intraocular pressure (i.e. Ocular Hypertension, Glaucoma)
    - Recent bowel obstruction or bowel surgery within the past 3 months
    - Recent Pneumothorax
    - History of increased intracranial pressure (i.e. Pseudotumor cerebri, subdural or subarachnoid)
    - Recent intraocular or middle ear surgery within the past 3 months
    - History of human immunodeficiency viruses (HIV)/acquired immune deficiency syndrome (AIDS) or immunocompromised patient
    - Current hemodynamic instability, impaired oxygenation (oxygen saturation [SpO2] less than 95%)
    - ANY Category III fetal tracings
    - Category III tracing or category II tracing with fetal heart rate (FHR) baseline tachycardia/ bradycardia, minimal variability, or recurrent late decelerations and/or prolonged deceleration
    - SpO2 of less than 95% on room air
    - Simultaneous use of the tub. Wait 15 minutes after last use to be in tub

C. Precautions for Use: situations that may require additional observation/monitoring while nitrous oxide is in use
    - Recurrent variable decelerations with minimal or absent variability

- History of chronic opioid dependence (suboxone, methadone, chronic pain medication). Preference would be for epidural anesthesia

D. An OB provider will evaluate the patient for suitability and contraindications to the use of nitrous oxide for pain control. This evaluation may be completed during the prenatal period and the informed consent discussion and signed Informed Consent for Nitrous Oxide Used as Labor Analgesia Form #OBS20411 documented in the prenatal record.

E. Nursing must confirm the presence of the signed consent and obtain a provider's order prior to the initiation of nitrous oxide.

F. For patients receiving nitrous oxide, follow fall policy at your institution.

G. No opioids or sedatives may be given while nitrous oxide is in use and for 15 minutes post discontinuation.

H. Vital signs (FHR, non-invasive blood pressure [NIBP], heart rate [HR], respiratory rate [RR], SpO2, pain score) will be assessed every 15 minutes for the first hour and then every 30 minutes for the duration of nitrous oxide therapy.

I. All patients desiring nitrous oxide for pain management must exhibit a Category I fetal tracing within 30 minutes prior to initiation. Continuous fetal monitoring is not required during the administration of nitrous oxide. Ongoing fetal assessments may be completed per intermittent monitoring or auscultation protocol.

J. Nitrous oxide will be administered using a blender delivery system with a scavenger providing a 50% concentration of nitrous oxide in 50% oxygen. Equipment will be set-up, used, and cleaned according to the manufacturer's instructions.

K. OB staff in their 1st or 2nd trimester of pregnancy should not care for patients receiving nitrous oxide. Nitrous oxide will be discontinued for the following reasons:
   - Patient request
   - Desire to move to an alternative form of pain management
   - Suspected maternal or fetal intolerance
   - After 6 hours of nitrous oxide administration

Procedure

A. Ensure there is a completed consent in the chart. Notify the OB provider of the patient's request for nitrous oxide and obtain an order for initiation of nitrous oxide.

B. Obtain regulator from Pyxis.

C. Prepare nitrous oxide administration equipment and ensure all equipment is in proper working order.

D. Instruct the patient in the self-administration of nitrous oxide. Include information on:
   - Realistic expectations of nitrous oxide.
   - Potential side effects.
   - Proper use of the demand mask and timing of use.
   - All support persons present are informed they may not assist the patient in the

administration of nitrous oxide or tamper with the equipment in any way.

- Fall precautions.

E. Observe and monitor the patient for the first 15 minutes of nitrous oxide use. Remain with the patient if the patient desires to be out of the bed and/or mobile about room while using the nitrous oxide.

F. Ensure that only the patient uses the nitrous oxide by completing frequent rounding. In the event a visitor attempts to use the mask, the registered nurse (RN) is to remove the nitrous oxide from the birthing room and the visitor will be required to leave. The provider will be notified if this occurs and an alternate form of pain control will be considered.

G. Document in the emergency health record (EHR):

- Patient education of nitrous oxide.
- Initiation of nitrous oxide.
- Patient use and tolerance of nitrous oxide during administration; summary documentation every 30 minutes is adequate.
- Vital signs, SpO2 and pain scores.
- Termination of nitrous oxide.

H. Disinfect machine thoroughly after use with an approved cleaner and return it to proper storage upon discontinuation of use. Ensure that any used disposable parts are properly discarded and replaced.

I. Return clean regulator to Pyxis.

Competency Requirements

A. All staff involved in the assembly, administration, or disassembly of nitrous oxide must receive training by an approved preceptor during orientation.

B. Annual ongoing competency validation will be completed by the unit educator per the hospital approved process.

References

1. Gilbert J. Grant, MD (2023, June). Pharmacologic management of pain during labor and delivery. Retrieved from UpToDate.
2. ACOG. (2020, April). Obstetric analgesia and anesthesia. Practice Bulletin 209
3. AWHONN. (2020). Analgesia and anesthesia in the intrapartum period: Evidence-based clinical guideline. Washington DC.

Keywords

nitrous oxide, antepartum, intrapartum, immediate post partum

Approval Signatures

Step Description	Approver	Date
P&T Committee	Heather Tolfree: Mgr Pharmacy - CPS	Pending
P&T Committee	William Evans: Mgr Pharmacy - CPS	11/6/2025
Mgr Nursing Services (MMC)	Sarah McClure: Mgr Nursing Services	11/5/2025
Document Owner	Lori Barnes: Mgr Nursing Services	11/3/2025

Applicability

Cadillac Hospital, Munson Medical Center

Standards

No standards are associated with this document

Unique Plan Description: ED Post Partum Hypertension - M
Plan Selection Display: ED Post Partum Hypertension
PlanType: Medical
Version: 1
Begin Effective Date: 7/30/2025 7/30/2025 12:21
End Effective Date: Current
Available at: ***CAD***
CHX
GRY
KMHC
MAN
MMC
OMH
POMH

ED Post Partum Hypertension
Non Categorized
- ☐ Code Status

Patient Care
- ☐ Start IV (nsg)
  Establish/Maintain IV Access
- ☐ Indwelling Urinary Catheter
  Indications: Provider order for Strict Immobilization, Instructions: To urometer
- ☐ Intake and Output
  q1hr, strict (DEF)*
  q2hr, strict
  q4hr, strict
  q8hr, strict
- ☐ Monitor (Specify)
  q1hr, Assess: Reflexes, Clonus, Lung Sound, Edema, Visual Changes, Headache, Epigastric Pain (DEF)*
  q2hr, Assess: Reflexes, Clonus, Lung Sound, Edema, Visual Changes, Headache, Epigastric Pain
  q4hr, Assess: Reflexes, Clonus, Lung Sound, Edema, Visual Changes, Headache, Epigastric Pain
  q8hr, Assess: Reflexes, Clonus, Lung Sound, Edema, Visual Changes, Headache, Epigastric Pain
- ☑ Call Dr. (Specify)
  Any changes in patient condition (DEF)*
  Vital Signs SBP less than 90 or greater than 160
  Vital Signs DBP less than 40 or greater than 110
  Output Call for urine output less than 30 ml/hr x 2 or less than 120 ml x 4 hours

Vital Signs
- ☐ Weights
  Daily
- ☐ Vital Signs
  q15min
  Comments: May stop Q15 min VS once not elevated for 3 checks.

Activity
- ☐ Position
  Lateral Positioning Preferred
- ☑ Activity
  Bedrest (DEF)*
  Bedrest, With Bathroom Privileges
- ☐ Misc ADL
  May be up in Wheelchair (specify)

Diet/Nutrition
- ☐ NPO
  NPO (DEF)*
  NPO Except Ice Chips
  Comments: sparingly

Laboratory

- ☐ Urinalysis with Culture if Indicated
  Urine, Collect STAT, ONCE
- ☐ Protein/Creatinine Ratio Urine
  Urine, Collect STAT, ONCE
- ☐ Drug Screen Urine
  Urine, Collect STAT, ONCE
- ☐ Drug Screen Urine - MedTox
  Urine, Collect STAT, T;N
- ☐ Nurse to Order Lab Test in Future Task
  Enter order for urine protein 24 hour when urine has been collected
- ☑ CBC w/o Diff
  Blood, Collect STAT, ONCE
- ☐ CBC w/ Diff
  Blood, Collect STAT, ONCE
- ☐ Basic Metabolic Panel
  Blood, Collect STAT, ONCE
- ☐ Comprehensive Metabolic Panel
  Blood, Collect STAT, ONCE
- ☑ ALT
  Blood, Collect STAT, ONCE
- ☑ AST
  Blood, Collect STAT, ONCE
- ☑ Creatinine
  Blood, Collect STAT, ONCE
- ☑ Uric Acid
  Blood, Collect STAT, ONCE
- ☑ BUN
  Blood, Collect STAT, ONCE
- ☐ PT
  Blood, Collect STAT, ONCE
- ☑ Type and Screen
  Blood, Collect STAT, ONCE
- ☐ Fibrinogen Level
  Blood, Collect STAT, ONCE
- ☐ Electrolyte Panel
  Blood, Collect STAT, ONCE
- ☐ Group B Strep by PCR Vag/Rectal
  Vaginal Rectal, Collect STAT, ONCE
- ☐ Fingerstick Blood Sugar by Nursing
- ☐ Glucose Level
  Blood, Collect STAT, ONCE

Consults/Referrals

- ☐ Consult (Specified)
  Consult Reason: OB High Risk
- ☐ Lactation Services Consult
- ☐ Case Management / MSW Referral
- ☐ Home Care Referral
- ☐ Consult WOCN (Specified)
  Consult Phys/Group +WOCN Skin Ostomy Wound

Therapies

- ☐ Physical Therapy - Eval & Treat
  Patient cleared for treatment today, Instructions: for patient on extended bedrest

Continuous Infusions

- ☑ Intermittent Lock - Peripheral Saline Flush(SUB)*
- ☐ Lactated Ringers IV SOLN

1,000 mL, IV, 125 mL/hr (DEF)*
1,000 Note, IV, 80 mL/hr

☐ Dextrose 5%-Lactated Ringers IV SOLN
1,000 mL, IV, 125 mL/hr (DEF)*
1,000 mL, IV, 80 mL/hr

Medications

Hypertensive Crisis

☐ OB Hydralazine for Hypertensive Crisis(SUB)*

☐ OB Labetalol for Hypertensive Crisis(SUB)*

☐ OB Nifedipine for Hypertensive Crisis(SUB)*

Seizure Prophylaxis

Magnesium Sulfate is the agent of choice for seizure prophylaxis.(NOTE)*

☐ OB Mag Sulfate for Seizure Prophylaxis - M(SUB)*
In patients with renal insufficiency, utilize FOSphenytoin 1000 mg IVPB Once for seizure prophylaxis. FOSphenytoin should only be used for patients with renal impairment.(NOTE)*

☐ FOSphenytoin (Cerebyx in PE) IVPB
1,000 mg, IVPB, ONCE

☐ OB Recurrent Seizure Management - M(SUB)*

Hypertension

☐ labetalol
100 mg, Oral, Tab, BID (DEF)*
200 mg, Oral, Tab, BID

☐ NIFEdipine extended release
30 mg, Oral, Tab SR, DailyAC (DEF)*
60 mg, Oral, Tab SR, DailyAC
90 mg, Oral, Tab SR, DailyAC

Nausea/Vomiting

☐ Adult Nausea and Vomiting Protocol(SUB)*

System Auto-Generated

☐ Last Plan Review Date

***Report Legend:**
DEF - This order sentence is the default for the selected order
GOAL - This component is a goal
IND - This component is an indicator
INT - This component is an intervention
IVS - This component is an IV Set
NOTE - This component is a note
Rx - This component is a prescription
SUB - This component is a subphase

Subcutaneous Insulin for Mild – Moderate DKA Protocol

Purpose: This is a subcutaneous (SubQ) insulin protocol that is an alternative to insulin drip for patients with mild-moderate DKA.

DKA Diagnosis and Eligibility for SubQ Protocol:		
<u>Does patient meet ALL THREE criteria for DKA?</u> 1. **Hyperglycemia**: serum glucose or capillary glucose > 200 mg/dL OR diagnosed diabetes 2. **Ketosis**: serum β-hydroxybutyrate ≥ 30 mg/dL 3. **Acidemia**: blood (venous or arterial) gas pH ≤ 7.3 or serum bicarbonate ≤18 mmol/L	**AND**	**<u>Meet all SIX criteria:</u>** 1. Blood gas (venous or arterial) pH ≥ 7 2. Serum bicarbonate ≥ 10 mmol/L 3. Alert/Awake or drowsy mental status 4. Hemodynamically stable 5. β-hydroxybutyrate < 62 mg/dL 6. 18 years of age or older

EXCLUSION for SubQ Pathway; Requires Insulin Drip	
• Pregnancy • Acute CHF Exacerbation • Acute Coronary Syndrome • ESRD or CKD Stage 4 or 5	• Acute Liver Failure or Cirrhosis • Serious Infections • Weight >120 kg • High-dose Corticosteroids

Contact provider to consider transition to Insulin Infusion Procol for any of the following:	
Clinical decline: New altered mental status, vomiting, or hemodynamic instability.	**Ketones/Gap not improving:** β-hydroxybutyrate not decreased by at least 20% in 4 hr or anion gap increasing.
Persistent hyperglycemia: Blood glucose remains >250 mg/dL for >6 hr despite protocol adherence.	**Worsening acidosis:** pH or bicarbonate decreased from previous BMP

Owner: Pharmacy
Reference Text created on 11/17/2025
Reference Text attached to Subcutaneous Insulin Management for Mild-Moderate DKA Power Plan

Protocol:

1. **Initial Fluid Management for Dehydration or Fluid losses:**
   Give 20 mL/kg LR (preferred) or 0.9% NaCl fluid bolus (10 mL/kg if concerned for fluid overload)

2. Initial Electrolyte Replacement:

Serum potassium < 3.5 mmol/L -> potassium replacement required **before** starting insulin therapy

Serum potassium ≥ 3.5 mmol/L -> Replacement before insulin therapy NOT required; follow Electrolyte Replacement Protocol per order.

BMP every 2 hours until serum potassium ≥ 3.5. BMP may be drawn even if potassium is still infusing. Initiate insulin once serum potassium ≥ 3.5. Call provider if repeat serum potassium <3.5.

Follow Standard Electrolyte replacement as indicated*

*If serious concern for hypokalemia, consider central line and potassium infusion rate of 20mEq/hr and/or advancement from Standard to more intensive DKA Electrolyte Replacement Protocol.

3. Start Subcutaneous Insulin and maintenance IV fluids

Administer SubQ insulin based on initial blood glucose:

If Blood Glucose > 250 mg/dL: Administer insulin lispro 0.2 units/kg subcutaneous
If Blood Glucose ≤ 250 mg/dL: Administer insulin lispro 0.1 units/kg subcutaneous

Provider to select both dextrose and non-dextrose containing solution when initiating protocol based on initial potassium:

If Serum potassium ≤ 5.3 mmol/L: 0.45 % NaCl + KCl 20 mEq/L and D5W/0.45 % NaCl + KCl 20mEq/L
If Serum potassium > 5.3 mmol/L: 0.45 % NaCl and D5W/0.45 % NaCl

RN to start maintenance fluids based on initial blood glucose:
If initial blood glucose is > 250mg/dL: 0.45% NaCl (+/- KCl) at 150mL/hr
If initial blood glucose is ≤ 250 mg/dL: 0.45 % NaCl (+/- KCl) at 50 mL/hr AND D5W/0.45 % NaCl (+/- KCl) at 100 mL/hr

Owner: Pharmacy
Reference Text created on 11/17/2025
Reference Text attached to Subcutaneous Insulin Management for Mild-Moderate DKA Power Plan

Monitoring Protocol:

1. Check POC glucose every 2 hours and follow pathway below based on current blood glucose level
2. BMP every 4 hours -> follow electrolyte replacement protocol

Blood glucose level		Insulin lispro dose (SubQ) – *round to nearest whole unit*	Fluids
BG ≥250		0.2 unit/kg	Continue 0.45% NaCl (+/- KCl) at 150 mL/hr
Decrease 0.45% NaCl (+/- KCl) to 50 mL/hr for remainder of protocol			
First BG < 250 **START** D5W/0.45% NaCl at rate in right column	200 - 250	0.1 unit/kg	• START D5W/0.45% NaCl (+/- KCl) at 100 mL/h
	150 - 199	0.1 unit/kg	• START D5W/0.45% NaCl (+/- KCl) at 150 mL/hr
	100 - 149	0.1 unit/kg	• START D5W/0.45% NaCl (+/- KCl) at 200mL/hr
	70 - 99	Hold Insulin	• START D5W/0.45% NaCl (+/- KCl) at 250mL/hr • NOTIFY PROVIDER
Subsequent BG (after D5W/0.45% NaCl initiated) **ADJUST** D5W/0.45% NaCl by increment in right column	>250	0.2 unit/kg	• DECREASE D5W/0.45% NaCl (+/- KCl) by 50mL/hr
	200 - 250	0.1 unit/kg	• No change
	150 - 199	0.1 unit/kg	• If BG DECREASED or unchanged from previous, INCREASE D5W/0.45% NaCl (+/- KCl) **by** 50mL/hr (max 250mL/hr). • If BG INCREASED from previous, no change.
	100 - 149	0.1 unit/kg	• If BG DECREASED or unchanged from previous, INCREASE D5W/0.45% NaCl (+/- KCl) **by** 100mL/hr (max 250mL/hr). • If BG INCREASED from previous, INCREASE D5W/0.45% NaCl (+/- KCl) **by** 50mL/hr (max 250mL/hr)
	70 – 99	Hold Insulin	• INCREASE D5W/0.45% NaCl (+/- KCl) **to** 250mL/hr. • NOTIFY PROVIDER • Repeat BG 15 minutes post rate change and q 15 min until >100 • If D5W already at 250mL/hr OR BG remains <100 after 1hr, provider may consider D10W
*** BG LESS THAN 70***		1. Hold Insulin 2. Increase D5W/0.45% NaCl (+/- KCl) **to** 250mL/hr. 3. Follow hypoglycemia protocol. 4. After treatment of hypoglycemia, NOTIFY PROVIDER, check blood glucose every 15 minutes until ≥ 100mg/dL. 5. Resume insulin once blood glucose ≥ 100 mg/dL	

Owner: Pharmacy
Reference Text created on 11/17/2025
Reference Text attached to Subcutaneous Insulin Management for Mild-Moderate DKA Power Plan

TRANSITION TO MAINTENANCE INSULIN REGIMEN - Notify provider when all of the following criteria are met:

1. pH > 7.3
2. Anion gap < 12
3. Serum bicarbonate > 18
4. Blood glucose < 200
5. Beta-hydroxybutyrate < 5 or trending down
6. Patient is tolerating PO & ready to resume full diet

- **Assess** prior insulin doses and adjust if indicated based on prior glycemic control.
- **If resuming insulin pump:** Ensure patient has all required supplies and that pump is functioning and infusing appropriately prior to discontinuing DKA protocol.
- If new insulin regimen consider:
    - Calculate Total Daily Dose (TDD)
        - Total Daily Dose (TDD) = 0.5 - 0.6 units/kg/day
        - Can consider lower TDD = 0.3 units/kg/day if patient has risk factors for hypoglycemia (kidney failure, frailty, etc.)
    - Initiate 50% of TDD as insulin glargine and 50% of TDD as insulin lispro TID AC
    - Add sliding scale insulin order
- **Basal overlap:** Administer the first dose of long-acting basal insulin **at least 2 hours before** discontinuing SubQ insulin DKA protocol to ensure continuous coverage. Basal insulin may be given simultaneously with last DKA protocol SQ rapid acting insulin dose.
- **Nutritional:** Resume nutritional insulin once the patient is eating.
- **Monitor:** Monitor blood glucose q2hr x2 after administration of long-acting basal insulin or after resuming insulin pump. Verify two consecutive BG values <200 mg/dL, sustained anion gap closure, and stable oral intake before discontinuing SubQ pathway.

Owner: Pharmacy
Reference Text created on 11/17/2025
Reference Text attached to Subcutaneous Insulin Management for Mild-Moderate DKA Power Plan

Nursing Notes/Quick Reference:

Before Initiating SQ Insulin	During SQ Insulin Pathway	During Transition to Maintenance Regimen
❑ Ensure all baseline labs drawn STAT per provider order ❑ Administer initial K replacement ordered by provider (if applicable). Do not initiate insulin until K ≥ 3.5 ❑ Q2h BMP until K is ≥ 3.5 (if applicable) ❑ Start fluid bolus as ordered by provider ❑ POC blood glucose	❑ After completion of initial fluid bolus, initiate maintenance fluids ordered by provider ❑ Order and administer K replacement per electrolyte replacement protocol ❑ Draw BMP Q4h ❑ POC blood glucose checks Q2h ❑ Administer subcutaneous insulin per nomogram based on POC glucose ❑ Adjust fluid rates based on POC glucose (see protocol chart above)	❑ Obtain orders and initiate Lantus or insulin pump concurrently with last q2hr subcutaneous insulin lispro dose prior to discontinuation of power plan. ❑ Continue dextrose infusion for two hours after last protocol subcutaneous insulin lispro dose OR until patient is able to eat (whichever comes first). ❑ Monitor blood glucose q2hr x2 after administration of long-acting basal insulin or after resuming insulin pump. Verify two consecutive BG values <200 mg/dL, sustained anion gap closure, and stable oral intake before discontinuing SubQ pathway.

Notify Provider

❑ Any K results < 3.5 mmol/L. Provider to advise if insulin should be held or continued.
Provider may consider: advancing from Standard to DKA Electrolyte Replacement protocol, administering additional potassium replacement, and/or increasing potassium in maintenance fluids.

❑ Worsening Signs or Symptoms

❑ Any BG < 70. Provider may consider increased rate or concentration of dextrose infusion.

❑ When all criteria met for transition to maintenance regimen

Owner: Pharmacy
Reference Text created on 11/17/2025
Reference Text attached to Subcutaneous Insulin Management for Mild-Moderate DKA Power Plan

References

1. Umpierrez GE, Davis GM, ElSayed NA, et al. Hyperglycemic Crises in Adults With Diabetes: A Consensus Report. *Diabetes Care*. 2024;47(8):1257-1275. doi:10.2337/dci24-0032
2. Griffey RT, Schneider RM, Girardi M, et al. The SQuID protocol (subcutaneous insulin in diabetic ketoacidosis): Impacts on ED operational metrics. *Acad Emerg Med*. 2023;30(8):800-808. doi:10.1111/acem.14685
3. American Diabetes Association Professional Practice Committee; 6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2025. *Diabetes Care* 1 January 2025; 48 (Supplement_1): S128–S145. https://doi.org/10.2337/dc25-S006
4. Ersöz HO, Ukinc K, Köse M, et al. Subcutaneous lispro and intravenous regular insulin treatments are equally effective and safe for the treatment of mild and moderate diabetic ketoacidosis in adult patients. *Int J Clin Pract*. 2006;60(4):429-433. doi:10.1111/j.1368-5031.2006.00786.x
5. Karoli R, Fatima J, Salman T, Sandhu S, Shankar R. Managing diabetic ketoacidosis in non-intensive care unit setting: Role of insulin analogs. *Indian J Pharmacol*. 2011;43(4):398-401. doi:10.4103/0253-7613.83109
6. Umpierrez GE, Latif K, Stoever J, et al. Efficacy of subcutaneous insulin lispro versus continuous intravenous regular insulin for the treatment of patients with diabetic ketoacidosis. *Am J Med*. 2004;117(5):291-296. doi:10.1016/j.amjmed.2004.05.010
7. Vincent M, Nobécourt E. Treatment of diabetic ketoacidosis with subcutaneous insulin lispro: a review of the current evidence from clinical studies. *Diabetes Metab*. 2013;39(4):299-305. doi:10.1016/j.diabet.2012.12.003

Unique Plan Description: Subcutaneous Management for Mild-Moderate DKA
Plan Selection Display: Subcutaneous Management for Mild-Moderate DKA
Available at: ***CAD, CHX, GRY, KMHC, MAN, MMC, OMH,POMH***

Ongoing SQ Orders
Non Categorized

To initiate this protocol, patient must meet ALL of the following criteria:1. Beta-hydroxybutyrate less than 62mg/dL2. pH greater than or equal to 7.~~25~~3. Bicarbonate greater than or equal to 1~~5~~0 mmol/L ~~or greater~~4. Alert and oriented and/or drowsy, or at baseline neurologic status5. Hemodynamically stable(NOTE)*

Patient Care

- ☑ Subcutaneous Insulin Protocol for Mild-Moderate DKA
  ****See Reference text****
- ☑ Call Dr. (Specify)
  Call Dr to resume diet and maintenance SQ insulin when all 6 criteria are met: (1) pH GREATER than 7.3, (2) Anion gap LESS than 12, (3) Serum bicarbonate GREATER than 18~~15~~, (4) Blood glucose LESS than 200, (5) Beta-hydroxybutyrate LESS than 5 or trending d
- ☑ Communication to Nurse
  If serum K is LESS than ~~or equal to~~ 3.5 mmol/L, call provider and discuss before starting or continuing insulin.
- ☑ Remove Task
  T;N, Remove Insulin pump. If pump is malfunctioning, send home with family if possible. For functioning pump, store according to Insulin Pump Self-Management Policy., Patient or family to provide additional supplies to facilitate transition back to pump
- ☑ Monitor Blood Glucose
  q2hr, If blood glucose greater than 570mg/dL or less than 20mg/dL, nurse to enter order for lab to draw "Glucose Random" or "Glucose-Whole Blood" (quicker result).
- ☑ Obtain Urine Sample
- ☑ Intake and Output
  q1hr, Strict
- ☑ O2 Per Protocol
- ☑ Telemetry/Cardiac Monitoring Instructions
  Indications: Complex Patient, Telemetry Duration Continuous, Constant monitor, DKA patient
- ☐ Pulse Oximetry by Nursing

Vital Signs

- ☑ DKA Vital Signs(SUB)*
- ☑ NeuroLogical Checks Task
  q4hr (DEF)*
  q2hr
- ☑ Glasgow Coma Scale Assessment Task
  q4hr (DEF)*
  q2hr
- ☑ Call Dr. (Specify)
  For mental status changes.

Diet/Nutrition

- ☑ NPO
  NPO Except Ice Chips & Meds

Laboratory

Order BMP q2 hours until K is greater than 3.5. Once insulin starts, order BMP q4 hours.(NOTE)*

- ☐ CBC w/ Diff
  Blood, Collect STAT, ONCE
- ☐ Basic Metabolic Panel
  Blood, Collect STAT, ONCE
- ☐ Basic Metabolic Panel
  Blood, Collect Timed Study, T;N, q2hr, for 72 hour(s)
- ☐ Basic Metabolic Panel
  Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)

☐ Magnesium Level
Blood, Collect STAT, ONCE

☑ Magnesium Level
Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)

☐ Phosphorus Level
Blood, Collect STAT, ONCE

☑ Phosphorus Level
Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)

☑ POC iSTAT Chemistry & Gas Profile (nsg) Task
q1hr (DEF)*
q2hr
q4hr

☐ Blood Gas Venous
Blood, Collect STAT, ONCE
Comments: MUST BE DRAWN FROM CENTRAL LINE

☑ Blood Gas Venous
Blood, Collect Routine, T;N+240, q4hr, for 72 hour(s)
Comments: MUST BE DRAWN FROM CENTRAL LINE

☐ Beta-hydroxybutyrate
Blood, Collect STAT, T;N, ONCE

☑ Beta-hydroxybutyrate
Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)

☐ Hemoglobin A1c
Blood, Collect STAT, ONCE (DEF)*
Blood, Collect Am Draw, T+1;0330, for 1 dose/occurrence

☐ Osmolality
Blood, Collect STAT, ONCE

☐ Urinalysis with Culture if Indicated
Urine, Collect STAT, ONCE

☐ Lactic Acid (Venous)
Blood, Collect STAT, ONCE

☐ Blood Gas Arterial
Arterial, Collect STAT, T;N, ONCE

☐ Pregnancy Test, Serum (Auto)
Blood, Collect STAT, T;N, ONCE

☐ Pregnancy Test Serum
Blood, Collect STAT, T;N, ONCE

☐ Pregnancy Test Urine
Urine, Collect STAT, T;N, ONCE

☐ Blood Culture x2
Blood, STAT, T;N

☐ Creatine Kinase
Blood, Collect STAT, ONCE (DEF)*
Blood, Collect Am Draw, ONCE, for 1 dose/occurrence

☐ Comprehensive Metabolic Panel
Blood, Collect STAT, ONCE (DEF)*
Blood, Collect Am Draw, ONCE, for 1 dose/occurrence

☐ Amylase Level
Blood, Collect STAT, ONCE (DEF)*
Blood, Collect Am Draw, ONCE, for 1 dose/occurrence
Blood, Collect Routine, Daily Lab, for 3 day(s)

☐ Lipase Level
Blood, Collect Am Draw, ONCE, for 1 dose/occurrence (DEF)*
Blood, Collect Routine, Daily Lab, for 3 day(s)
Blood, Collect STAT, ONCE

☐ Cortisol

Blood, Collect STAT, ONCE

☐ HS Troponin(SUB)*

☐ Drug Screen Urine
Urine, Collect STAT, T;N, ONCE

☐ Drug Screen Urine - MedTox
Urine, Collect STAT, T;N, ONCE

☐ Hepatic Function Panel
Blood, Collect STAT, ONCE (DEF)*
Blood, Collect Am Draw, ONCE, for 1 dose/occurrence

Cardiology

☐ Electrocardiogram - M
STAT

☐ Electrocardiogram - ACKOPX
STAT

☐ EKG - G
STAT

☐ EKG Performed by ED/UC Staff Task
STAT

Continuous Infusions

Initial Fluid Management

LR is safe in DKA and may help resolve acidosis faster than 0.9% NaCl. Patients with hypovolemia should receive a total of 20 mL/kg fluid replacement. (NOTE)*

☐ Lactated Ringers IV BOLUS
infuse as rapidly as possible, 20 mL/kg, IV, Inject, ONCE (DEF)*
infuse as rapidly as possible, 10 mL/kg, IV, Inject, ONCE

Commented [CC1]: Precheck

☐ Sodium Chloride 0.9% IV BOLUS
infuse as rapidly as possible, 20 mL/kg, IV, ONCE (DEF)*
infuse as rapidly as possible, 10 mL/kg, IV, ONCE

INITIAL ELECTROLYTE MANAGEMENT

If serum K is LESS than 3.5 mmol/L, K should be replaced BEFORE starting insulin. May give oral and IV concurrently.(NOTE)*

☐ Potassium Chloride IVPB
20 mEq, IVPB, IVPB, q2hr, STAT, 2 dose/occurrence
Comments: Total 40 mEq for this order.

☐ Potassium Chloride SR TAB
20 mEq, Oral, ONCE, STAT

☐ Potassium Bicarbonate-Citric Acid EFFERVESCENT
20 mEq, Oral, Tab Effervescent, ONCE, STAT
Comments: Dissolve each tab completely in at least 85 mL cold or ice water. Take with food.

Medications

☑ Hypoglycemia Treatment Adult, Child (NOT tube fed)(SUB)*

Insulins

☑ Note
1 Note, Note, q2hr, Routine
Comments: Give SQ insulin q2hr based on ~~CBG~~ POC glucose per SQ DKA protocol.

☑ Humalog Insulin SUBCUT
0.2 unit/kg, Subcut, Inject (Not IV), q2hr, PRN Other
Comments: PRN Blood glucose greater than or equal to 250mg/dL

☑ Humalog Insulin SUBCUT
0.1 unit/kg, Subcut, Inject (Not IV), q2hr, PRN Other
Comments: PRN Blood glucose ~~less than 250~~100-249mg/dL

Select one non-dextrose containing and one dextrose containing fluid.(NOTE)*
Initial potassium LESS than or equal to 5.3 mmol/L(NOTE)*

☐ Sodium Chloride 0.45%+KCl 20 mEq/L IV SOLN
1,000 mL, IV, ~~150 mL/hr~~TITRATE
Comments: Decrease rate to 50mL/hr and start dextrose infusion when glucose less than 250mg/dL.

☐ Dextrose 5% -0.45% NaCl + KCl 20 mEq/L IV SOLN
1,000 mL, IV, TITRATE
Comments: Begin when glucose less than 250mg/dL and titrate per protocol.

Initial potassium GREATER than 5.3 mmol/L(NOTE)*

☐ Sodium Chloride 0.45% IV SOLN
1,000 mL, IV, ~~150 mL/hr~~TITRATE
Comments: Decrease rate to 50mL/hr and start dextrose infusion when glucose less than 250mg/dL.

~~Initial potassium LESS than 5.3 mmol/L.(NOTE)*~~

~~☐ Dextrose 5% -0.45% NaCl + KCl 20 mEq/L IV SOLN~~
~~*1,000 mL, IV, TITRATE*~~
~~*Comments: Begin when glucose less than 250mg/dL and titrate per protocol.*~~
~~Initial potassium GREATER than 5.3 mmol/L(NOTE)*~~

☐ Dextrose 5% / NaCl 0.45% ~~*NICU*~~ IV SOLN (IVS)*
Dextrose 5%-Sodium Chloride 0.45% IV SOLN ~~*NICU*~~
1,000 mL, IV, Start T;N, TITRATE, Routine
Comments: Begin when glucose less than 250mg/dL and titrate per protocol.

Protocols/Standards

☑ Electrolyte Replacement Protocol
Potassium & Magnesium, Note, q12hSTD, Routine
Comments: This is a REMINDER Note to check for current labs during your shift and to replace per protocol. IF no labs are ordered then no replacement necessary. REMEMBER to assess renal function per protocol guidelines BEFORE replacing any electrolytes based on this order.Protocol Criteria for use:- Provider will order specific protocol- Nurse will assess creatinine and urine output and use the appropriate nursing electrolyte replacement care set to order replacement based on results of ordered labs - if no labs are ordered, replacement will not occur.- Creatinine is less than 2.5 mg/dL and not on dialysis,- Urine output is greater than or equal to 20mL/hr for last 3 hours.- If no Cr has been done in the past 72 hour nurse to order Cr STAT may be added to blood in lab, beginreplacement and assess creatinine when results obtained- If Cr is elevated greater than 2.5 mg/dl stop replacement and notify physician.- Do not replace electrolytes if repeated lab results are less than 1 hour after last replacement finished.Potassium Chloride ReplacementMax IV rate 10 mEq/hr if NOT on cardiac monitorK 2.9 or less Call provider & administer potassium chloride 40 mEq oral/NG q2hr x 2 doses OR 20 mEq IVPB x 4 dosesK 3.0-3.5 Give potassium chloride 30 mEq oral/NG q2hr x 2 doses or 20 mEq IVPB x 3 dosesUse Nursing - KCl Oral Electrolyte Replacement, Nursing - KCl Peripheral IV Electrolyte Replacement or Nursing - KCl Central IV Electrolyte Replacement CareSet, as appropriate.Strategies in minimizing phlebitis for peripheral KCl IV Electrolyte Replacement:-Use oral replacement when appropriate-Infuse at a slower rate -Piggyback the IV KCl bag (via y-site) onto maintenance infusion (ie- 0.9% NaCl or D5W) -Apply dry COLD compress to the affected siteK Phos Replacement*Do Not give both KCl and KPhos *Maximum rate is 7 mmol/hr if not on a cardiac monitor*15 mmol KPhos replaces 22 mEq of potassiumK 2.9 or less AND Phos 1.9 or less: Call provider & administer KPhos 15 mmol IVPB x 4 dosesK 3 - 3.5 AND Phos 1.9 or less: Give KPhos 15 mmol IVPB x 3 dosesUse Nursing - KPhos IV Electrolyte Replacement, as appropriateNursing - Mag Sulfate Electrolyte ReplacementMagnesium ReplacementMag Level 1.6 - 1.9: administer Magnesium Oxide 250 mg Tab x 1 dose, OR Magnesium Sulfate 2 gm IVPB x 1 doseMag Level 1.5 or less: administer Magnesium Sulfate 4 gm IVPB over 4 hours x 1 doseMagnesium max rate 1 gm/hr*

☐ DKA Electrolyte Replacement Protocol
DKA K+ Mag Phos Replacement (Reminder Note), Note, q12hSTD
Comments: Potassium < 3.3: Total dose: 80 mEq over minimum of 4 hours, AND 1. PAUSE insulin 2. Call provider to discuss before resumingPotassium 3.3 - 3.5: Total dose: 60 mEq over minimum of 3 hoursPotassium 3.6 - 3.9: Total dose: 40 mEq over minimum of 2 hoursPotassium 4 - 5.2: Total dose: 20 mEq over minimum of 1 hourPotassium > 5.5: Call providerMagnesium < 1.5: Total dose: 4 gm over 4 hoursMagnesium 1.6 - 1.9: Total dose: 2 gm over 2 hoursPhosphate < 1.5: Total dose: 45 mmol IVPB (15 mmol IVPB q2hr X 3, or 2 tab KPhos Neutral oral q2hr x 3)Phosphate 1.5 - 1.9: Total dose: 30 mmol IVPB (15 mmol IVPB q2hr X 2, or 2 tab KPhos Neutral oral q2hr x 2)

☐ DKA Electrolyte Protocol

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Commented [CC2]: Can we link these, and the ones below? So, basically they pick both fluids at the same time and they are concordant?

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Commented [CC3]: Can we add a note somewhere in this section? "Order DKA Electrolyte Replacement Protocol for patients requiring more aggressive replacement. Consider for patients with hypokalemia at baseline or significant acidosis (ex. pH<7.2)"

☑ Start Med Hx and UM Review - ED

☐ Last Plan Review Date

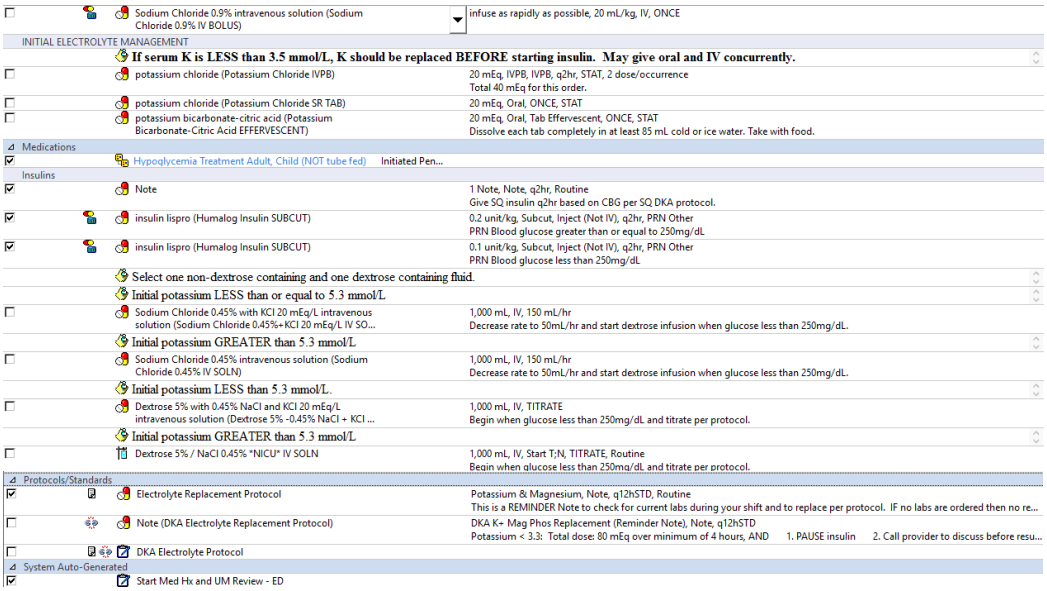
Less than 18 years

Non Categorized

This PowerPlan should not be utilized in patients under the age of 18 years old.(NOTE)*

Subcutaneous Management for Mild-Moderate DKA, Ongoing SQ Orders (Initiated Pending)

Non Categorized			
	To initiate this protocol, patient must meet ALL of the following criteria: 1.Beta-hydroxybutyrate less than 62mg/dL 2.pH greater than or equal to 7.25 3.Bicarbonate 15 mmol/L or greater 4.Alert and oriented, or at baseline neurologic status 5.Hemodynamically stable		
Patient Care			
☑	Subcutaneous Insulin Protocol for Mild-Moderate DKA		***See Reference text***
☑	Call Dr. (Specify)		Call Dr to resume diet and maintenance SQ insulin when all 6 criteria are met: (1) pH GREATER than 7.3, (2) Anion gap LESS than 12, (3) Serum bicarbonate GREATER than 15, (4) Blood glucose LESS than 200, (5) Beta-hydroxybutyrate LESS than 5 or trending d
☑	Communication to Nurse		If serum K is LESS than or equal to 3.5 mmol/L, call provider and discuss before starting or continuing insulin.
☑	Nurse to Discontinue/Remove Task (Remove Task)		T;N, Remove Insulin pump. If pump is malfunctioning, send home with family if possible. For functioning pump, store according to Insulin Pump Self-Management Policy., Patient or family to provide additional supplies to facilitate transition back to pump
☑	Monitor Blood Glucose		q2hr, If blood glucose greater than 570mg/dL or less than 20mg/dL, nurse to enter order for lab to draw "Glucose Random" or "Glucose-Whole Blood" (quicker result).
☑	Obtain (Obtain Urine Sample)		
☑	Intake and Output		q1hr, Strict
☑	O2 Per Protocol		
☑	Telemetry/Cardiac Monitoring Instructions		Indications: Complex Patient, Telemetry Duration Continuous, Constant monitor, DKA patient
☐	Pulse Oximetry by Nursing		
Vital Signs			
☑	DKA Vital Signs	Initiated Pen...	
☑	NeuroLogical Checks Task		q4hr
☑	Glasgow Coma Scale Assessment Task		q4hr
☑	Call Dr. (Specify)		For mental status changes.
Diet/Nutrition			
☑	NPO		NPO Except Ice Chips & Meds
Laboratory			
	Order BMP q2 hours until K is greater than 3.5. Once insulin starts, order BMP q4 hours.		
☐	CBC w/ Diff		Blood, Collect STAT, ONCE
☐	Basic Metabolic Panel		Blood, Collect STAT, ONCE
☐	Basic Metabolic Panel		Blood, Collect Timed Study, T;N, q2hr, for 72 hour(s)
☐	Basic Metabolic Panel		Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)
☐	Magnesium Level		Blood, Collect STAT, ONCE
☑	Magnesium Level		Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)
☐	Phosphorus Level		Blood, Collect STAT, ONCE
☑	Phosphorus Level		Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)
☑	POC iSTAT Chemistry & Gas Profile (nsg) Task		q1hr
☐	Blood Gas Venous		Blood, Collect STAT, ONCE MUST BE DRAWN FROM CENTRAL LINE
☑	Blood Gas Venous		Blood, Collect Routine, T;N+240, q4hr, for 72 hour(s) MUST BE DRAWN FROM CENTRAL LINE
☐	Beta-hydroxybutyrate		Blood, Collect STAT, T;N, ONCE
☑	Beta-hydroxybutyrate		Blood, Collect Timed Study, T;N+240, q4hr, for 72 hour(s)
☐	Hemoglobin A1c		Blood, Collect STAT, ONCE
☐	Osmolality		Blood, Collect STAT, ONCE
☐	Urinalysis with Culture if Indicated		Urine, Collect STAT, ONCE
☐	Lactic Acid (Venous)		Blood, Collect STAT, ONCE
☐	Blood Gas Arterial		Arterial, Collect STAT, T;N, ONCE
☐	Pregnancy Test, Serum (Auto)		Blood, Collect STAT, T;N, ONCE
☐	Pregnancy Test Urine		Urine, Collect STAT, T;N, ONCE
☐	Blood Culture (Blood Culture x2)		Blood, STAT, T;N
☐	Creatine Kinase		Blood, Collect STAT, ONCE
☐	Comprehensive Metabolic Panel		Blood, Collect STAT, ONCE
☐	Amylase Level		Blood, Collect STAT, ONCE
☐	Lipase Level		Blood, Collect Am Draw, ONCE, for 1 dose/occurrence
☐	Cortisol		Blood, Collect STAT, ONCE
☐	HS Troponin		
☐	Drug Screen Urine		Urine, Collect STAT, T;N, ONCE
☐	Hepatic Function Panel		Blood, Collect STAT, ONCE
Cardiology			
☐	Electrocardiogram - M		STAT
☐	EKG Performed by ED/UC Staff Task		STAT
Continuous Infusions			
Initial Fluid Management			
	LR is safe in DKA and may help resolve acidosis faster than 0.9% NaCl. Patients with hypovolemia should receive a total of 20 mL/kg fluid replacement.		
☐	Lactated Ringers Injection intravenous solution (Lactated Ringers IV BOLUS)		infuse as rapidly as possible, 20 mL/kg, IV, Inject, ONCE
Protocols/Standards			
☑	Electrolyte Replacement Protocol		Potassium & Magnesium, Note, q12hSTD, Routine This is a REMINDER Note to check for current labs during your shift and to replace per protocol. IF no labs are ordered then no re...
☐	Note (DKA Electrolyte Replacement Protocol)		DKA K+ Mag Phos Replacement (Reminder Note), Note, q12hSTD Potassium < 3.3: Total dose: 80 mEq over minimum of 4 hours, AND 1. PAUSE insulin 2. Call provider to discuss before resu...
☐	DKA Electrolyte Protocol		
System Auto-Generated			
☑	Start Med Hx and UM Review - ED		


Sodium Chloride 0.9% intravenous solution (Sodium Chloride 0.9% IV BOLUS)
infuse as rapidly as possible, 20 mL/kg, IV, ONCE
INITIAL ELECTROLYTE MANAGEMENT
If serum K is LESS than 3.5 mmol/L, K should be replaced BEFORE starting insulin. May give oral and IV concurrently.
potassium chloride (Potassium Chloride IVPB)
20 mEq, IVPB, IVPB, q2hr, STAT, 2 dose/occurrence
Total 40 mEq for this order.
potassium chloride (Potassium Chloride SR TAB)
20 mEq, Oral, ONCE, STAT
potassium bicarbonate-citric acid (Potassium Bicarbonate-Citric Acid EFFERVESCENT)
20 mEq, Oral, Tab Effervescent, ONCE, STAT
Dissolve each tab completely in at least 85 mL cold or ice water. Take with food.
Medications
Hypoglycemia Treatment Adult, Child (NOT tube fed)
Initiated Pen...
Insulins
Note
1 Note, Note, q2hr, Routine
Give SQ insulin q2hr based on CBG per SQ DKA protocol.
insulin lispro (Humalog Insulin SUBCUT)
0.2 unit/kg, Subcut, Inject (Not IV), q2hr, PRN Other
PRN Blood glucose greater than or equal to 250mg/dL
insulin lispro (Humalog Insulin SUBCUT)
0.1 unit/kg, Subcut, Inject (Not IV), q2hr, PRN Other
PRN Blood glucose less than 250mg/dL
Select one non-dextrose containing and one dextrose containing fluid.
Initial potassium LESS than or equal to 5.3 mmol/L
Sodium Chloride 0.45% with KCl 20 mEq/L intravenous solution (Sodium Chloride 0.45%+KCl 20 mEq/L IV SO...
1,000 mL, IV, 150 mL/hr
Decrease rate to 50mL/hr and start dextrose infusion when glucose less than 250mg/dL.
Initial potassium GREATER than 5.3 mmol/L
Sodium Chloride 0.45% intravenous solution (Sodium Chloride 0.45% IV SOLN)
1,000 mL, IV, 150 mL/hr
Decrease rate to 50mL/hr and start dextrose infusion when glucose less than 250mg/dL.
Initial potassium LESS than 5.3 mmol/L.
Dextrose 5% with 0.45% NaCl and KCl 20 mEq/L intravenous solution (Dextrose 5% -0.45% NaCl + KCl ...
1,000 mL, IV, TITRATE
Begin when glucose less than 250mg/dL and titrate per protocol.
Initial potassium GREATER than 5.3 mmol/L
Dextrose 5% / NaCl 0.45% *NICU* IV SOLN
1,000 mL, IV, Start T;N, TITRATE, Routine
Begin when glucose less than 250mg/dL and titrate per protocol.
Protocols/Standards
Electrolyte Replacement Protocol
Potassium & Magnesium, Note, q12hSTD, Routine
This is a REMINDER Note to check for current labs during your shift and to replace per protocol. IF no labs are ordered then no re...
Note (DKA Electrolyte Replacement Protocol)
DKA K+ Mag Phos Replacement (Reminder Note), Note, q12hSTD
Potassium < 3.3: Total dose: 80 mEq over minimum of 4 hours, AND 1. PAUSE insulin 2. Call provider to discuss before resu...
DKA Electrolyte Protocol
System Auto-Generated
Start Med Hx and UM Review - ED

Tenecteplase 25 mg Vial FMEA Summary

Sessions: 10/8/25 & 10/14/25

Attendees (of one or both sessions): Cathi Cornelius, Brad Beaman, Christine Peplinski, Dr. William Britton, Dr. Rebecca Hess, Miranda Dykhouse, Billy Evans, Aprill Meeks, Trevor Warner, Casey Smits, Alex Callaway, Aleah Hunt, Dave Haugh, Heather Tolfree, Emily Warner

Highest Failure Modes

See associated spreadsheet with additional details

Pharmacist calculating dose incorrectly

- Current controls:
    - Indication labeled dosing charts
    - Emergency response packets (STEMI and stroke)
        - Opportunity for improvement described below due to variability in packet content across MHC
    - EMR dosing calculator/dose range checking when ordered electronically
- Actions Recommended:
    - Add Tenecteplase 25 mg vials to help differentiate/cause pause on dosing especially if pharmacist is needing more than two vials to prepare dose

Not using emergency response packet (STEMI and stroke)

- Current controls:
    - Dosing card attached to Tenecteplase vial at MHC facilities other than MMC
        - Opportunity for improvement described below due to current dosing card lists information for two indications with different dosing strategies
- Actions Recommended:
    - Adjusting Pyxis settings to include Pyxis labeling with indication for each Tenecteplase vial size and interactive Pyxis alerts

Overall FMEA Recommendations

- Add Tenecteplase 25 mg vials to formulary
- Review of all emergency response (STEMI and stroke) packets across MHC to standardize as able and ensure dosing recommendations included
    - Do not include vial specific information, like reconstitution instructions
- Adjusting Pyxis settings to include Pyxis labeling with indication for each Tenecteplase vial size and interactive Pyxis alerts (see Pyxis Alerts tab on FMEA)
- Create two different dosing cards; stroke indication with associated dosing for the 25mg vials and STEMI/PE indication with associated dosing for the 50mg vials
    - Institute workflow using Pharmacy Keeper for barcode scanning to increase accuracy of dosing cards applied to correct vial size.

Remdesivir Medication Use Evaluation

Alisa Siebenmorgan, Pharm.D.

October 2025

Situation:

A medication use evaluation was conducted to assess if patients who received remdesivir would have been candidates to receive Paxlovid. Given the frequent use of remdesivir and its associated vial cost of $650.72, the evaluation aimed to explore the potential for utilizing Paxlovid in mild inpatient COVID-19 cases and assess the financial implications. The evaluation aimed to identify cost comparison between remdesivir and Paxlovid in patients who may have been eligible for either treatment.

Background:

Criteria to receive Paxlovid includes patients hospitalized with mild to moderate COVID-19 who have risk factors of progressing to severe COVID-19 and are without contraindications or drug interactions. Patients were considered to have mild to moderate COVID-19 if they did not receive steroids and their oxygen requirements were not greater than baseline. Dexamethasone dosed at 6 mg once daily indicates a high severity COVID-19 infection. Guidance from current protocol suggests dexamethasone use in patients requiring supplemental oxygen and consider holding dexamethasone in patients with 1-2 L and less than 7 days of symptoms. Risk factors for progressing to severe COVID-19 were identified using Underlying Conditions and the Higher Risk for Severe COVID-19 | COVID-19 | CDC. The list of patient's home medications was compared to Liverpool COVID-19 Interactions for Paxlovid.

Facility	Count of FIN
MMC	50
GRY	10
CAD	8
OMH	7
MAN	2
CHX	1
KMHC	1
Grand Total	**79**

Assessment:

Patients admitted to a Munson Healthcare facility from January 26th, 2025 – September 4th, 2025, who received at least one dose of remdesivir were included. Data collected included days of therapy of remdesivir, concomitant use of dexamethasone for COVID-19 treatment, presence of risk factors, and home medication list. Further review of patients receiving dexamethasone was completed. If a patient received 3 days or less of remdesivir, the appropriateness of dexamethasone according to protocol guidance was assessed via the patient's oxygen requirements and duration of symptoms. Patients in which dexamethasone was used not according to protocol guidance were further evaluated for Paxlovid candidacy. Risk factors for progressing to severe COVID-19 were identified with the History and Physical completed on admission. The patient's reconciled home medication list at time of admission was compared to Liverpool Drug Interactions for Paxlovid. Drug regimens that would require modifications to be co-administered with remdesivir were recorded as such, and drugs were considered true contraindications to Paxlovid with do not co-administer recommendations.

N = 79 across Munson Healthcare system since January 26th, 2025

- 38 out of 79 (48.1%) of patients excluded for dexamethasone use
    - 24 out of 38 (63.2%) of patients received 3 days or less of remdesivir
        - 12 out of 24 (50%) of patients received dexamethasone appropriately
- 9 out of 79 (11.4%) of patients excluded for a nonmodifiable drug interaction
    - 3 out of 9 (33.3%) of patients receiving amiodarone
    - 3 out of 9 (33.3%) of patients receiving quetiapine
    - 2 out of 9 (22.2%) of patients receiving rivaroxaban
    - 1 out of 9 (11.1%) of patients receiving primidone
    - 1 out of 9 (11.1%) of patients receiving salmeterol
- 39 out of 79 (49.4%) of patients (including further reviewed dexamethasone patients) excluded for a modifiable drug interaction
    - 17 out of 39 (43.6%) of patients would require modification of at least 3 home medications to receive Paxlovid
    - 1 patient would require modification of 6 drugs
    - 19 out of 39 (48.7%) of patients on atorvastatin
    - 14 out of 39 (35.9%) of patients on apixaban
    - 7 out of 39 (17.9%) of patients on rosuvastatin
    - 6 out of 39 (15.4%) of patients on loperamide
- 1 patient did not receive a recorded dose
- 3 patients met criteria to receive Paxlovid

Cost Analysis:

Cost of 1 vial of remdesivir: $650.72

Cost of 1 pack Paxlovid: $1,371.96

Total cost avoidance estimate lies between $3,000 and $33,000 over an 8-month period depending on inclusion of modifiable drug interactions into Paxlovid criteria.

Cost Avoidance in Patients who Meet Paxlovid Criteria

Facility	Count of FIN	Sum of Cost Avoidance
CAD	1	$1,028.04
GRY	2	$2,656.08
Grand Total	**3**	**$3,684.12**

Cost Avoidance in Patients with Modifiable Drug Interactions

Facility	Count of FIN	Sum of Cost Avoidance
MMC	26	$22,243.12
OMH	4	$2,971.52
GRY	4	$4,923.68
CAD	2	$509.68
CHX	1	$(70.52)
MAN	1	$1,230.92
KMHC	1	$1,881.64
Grand Total	**39**	**$33,690.04**

Recommendations:

- Current use of remdesivir in patients with COVID-19 is appropriate. Dexamethasone dosed for COVID-19 is being used outside of protocol guidance, which may increase risks for patients such as poor glucose control and agitation.
- The numerous drug interactions that would require home therapy modification to receive Paxlovid are a barrier to its uses in the inpatient setting.
- Risks associated with adjusting home medications to receive Paxlovid include failure to identify all medications to be modified in a complex home drug regimen, failure to change the home medications correctly, and failure to re-adjust or restart home medications after treatment completion. This is of particular concern with one of the most common medications identified being an anticoagulant.

SBAR Summary: OTIC antibiotic/antibiotic-steroid combination drops

Situation

There is a need to evaluate the use and formulary status of Ciprodex (ciprofloxacin/dexamethasone OTIC drops) across Munson Healthcare sites. The goal is to optimize inventory and prescribing practices for ENT procedures, especially ear tube placements and acute otitis externa.

Background

- Ciprodex is currently stocked in several Pyxis machines but is listed as Non-Formulary in Med Manager.
- Historically, Ciprodex was expensive (~$400), but the price has dropped to around $70, which is still more expensive than alternatives.
- ENT providers occasionally request Ciprodex for severe cases with significant inflammation.
- Ofloxacin is used as the standard for ear tube cases at some MHC hospitals, and UpToDate supports fluoroquinolone drops for prophylaxis, with addition of fluoroquinolone plus steroid drops indicated for treatment of acute otitis media with otorrhea occurring post-procedure.
- Cortisporin is suggested as a less expensive alternative for acute otitis externa with intact tympanic membranes.

Assessment

- Ciprodex may not be necessary for routine surgical cases and could be reserved for severe infections.
- Ofloxacin could be promoted as the preferred agent, with Ciprodex available via request from pharmacy or limited Pyxis access.
- There is an opportunity to standardize practice and reduce unnecessary inventory costs.

Recommendation

- Add Ciprodex OTIC drops to formulary.
- Add Ofloxacin to OMH and MAN OR Pyxis machines.
-Educate providers as to availability of antibiotic ear drop without steroid as preferred agent for prophylaxis during eustachian tube placement.
- For acute otitis externa, preference for Cortisporin, with Ciprodex reserved for cases with non-intact tympanic membrane(s).

August 2025 CCornelius with assistance of Microsoft Copilot

MYRBETRIQ (Mirabegron)

Drug[1]**:** mirabegron (MYRBETRIQ)

- Manufacturer: Astellas Pharma US, Inc. and generics
- FDA Approval: June 28th, 2012

Drug Description[1,2]

- Drug Class: β3-adrenergic receptor agonist
  - Other agent(s) in class: vibegron
- FDA-Labeled Indication:
  - Treatment of overactive bladder (OAB) in adult patients with symptoms of urge urinary incontinence, urgency, and urinary frequency as monotherapy or in combination with an antimuscarinic agent
  - Treatment of neurogenic detrusor overactivity (NDO) in pediatric patients aged 3 years and older and weighing 35 pounds or more
- Non-FDA – Labeled Indication: None
- Supplied:
  - Suspension Reconstituted ER, Oral: 8mg/ml (100 mL)
  - Tablet Extended Release 24 Hour, Oral: 25mg, 50mg
- Storage:
  - Granules: Store dry granules at 20°C to 25°C (68°F to 77°F); excursions permitted to 15°C to 30°C (59°F to 86°F). Following reconstitution, store at 20°C to 25°C (68°F to 77°F) for up to 28 days; discard any unused portion
  - Tablets: Store at 25°C (77°F); excursions permitted to 15°C to 30°C (59°F to 86°F)

Pharmacokinetics/Pharmacodynamics[2]

- Mechanism of Action: Mirabegron is a selective beta-3 adrenergic receptor agonist that activates β3-receptors in the bladder, leading to relaxation of the detrusor smooth muscle during the urine storage phase and increasing bladder capacity. By targeting β3-receptors, mirabegron minimizes effects on β1- and β2-receptors, reducing the risk of major cardiovascular side effects. Clinically, this is crucial for managing OAB symptoms such as urgency, frequency, and incontinence, as it helps reduce involuntary bladder contractions and improves control over urination, making it a valuable option for patients sensitive to the side effects of non-selective adrenergic or anticholinergic agents
- Pharmacokinetic Properties:
  - Onset of action: Efficacy is seen within 8 weeks; steady state achieved within 7 days
  - Absorption: No clinically significant differences with fed vs. fasting
    - Time to peak: ~3.5 hours
  - Distribution: Bioavailability 29% to 35% (following 25 mg and 50 mg oral dosing, respectively); C_{max} and AUC are higher in females compared to males
    - Protein binding: ~71%
  - Metabolism: Extensive metabolism via multiple pathways; major CYP enzymes (CYP3A4, CYP2D6 - inhibitor); two major pharmacologically inactive metabolites produced
  - Elimination: Urine (55%; unchanged drug: 25%); feces (34%; unchanged drug: 0%)
    - Half-life Elimination: ~50 hours

Efficacy/Effectiveness/Comparative Trials[1, 3-7]

Mirabegron was evaluated in three, 12-week, double-blind, randomized, placebo-controlled, parallel group, multicenter clinical trials in patients with overactive bladder with symptoms of urge urinary incontinence, urgency, and urinary frequency (Studies 1, 2, and 3). Entry criteria required that patients had symptoms of overactive bladder for at least 3 months duration, at least 8 micturitions per day, and at least 3 episodes of urgency with or without incontinence over a 3-day period. The majority of patients were Caucasian (94%) and female (72%) with a mean age of 59 years (range 18 – 95 years). The population included both naïve patients who had not received prior muscarinic antagonist pharmacotherapy for overactive bladder (48%) and those who had received prior muscarinic antagonist pharmacotherapy for OAB (52%). The co-primary efficacy endpoints in all 3 trials were (1) change from baseline to end of treatment (Week 12) in mean number of incontinence episodes per 24 hours and (2) change from baseline to end of treatment (Week 12) in mean number of micturitions per 24 hours, based on a 3-day micturition diary. In Study 1 (SCORPIO), patients were randomized to placebo, mirabegron 50 mg, or an active control once daily. In Study 2 (ARIES), patients were randomized to placebo or mirabegron 50 mg once daily. In Study 3 (CAPRICORN), patients were randomized to placebo, mirabegron 25 mg or mirabegron 50 mg once daily.

Mirabegron add-on therapy to solifenacin succinate was evaluated in one, 12-week, double-blind, randomized, active-controlled, multicenter clinical trial in incontinent OAB patients who received solifenacin succinate for 4 weeks and required additional relief for their OAB symptoms (BESIDE). Entry criteria required that patients had symptoms of OAB for at least 3 months duration (urge urinary incontinence, urgency, and urinary frequency), and at least 1 incontinence episode during a 3-day period after being treated with solifenacin succinate 5 mg for 4 weeks. The majority of patients were Caucasian (94%) and female (83%) with a mean age of 57 years (range 18 to 89 years). Patients were randomized to solifenacin succinate 5 mg, solifenacin succinate 10 mg, or solifenacin succinate 5 mg plus mirabegron 25 mg once daily. After 4 weeks, all patients in the combination treatment arm had a dose increase from mirabegron 25 mg to mirabegron 50 mg.

The efficacy of mirabegron was evaluated in Study 9, a 52-week, open-label, baseline-controlled, multicenter, dose titration study in pediatric patients 3 years of age and older for the treatment of NDO. Study 9 included patients 3 to 17 years of age. In Study 9, a total of 86 patients 3 to 17 years of age received mirabegron. Of these, 71 patients completed treatment through week 24 and 70 completed 52 weeks of treatment. A total of 68 patients (43 patients 3 to less than 12 years of age and 25 patients 12 to 17 years of age) had valid urodynamic measurements for evaluation of efficacy. The primary efficacy endpoint was change from baseline in the patients' maximum cystometric (bladder) capacity (MCC) after 24 weeks of treatment with mirabegron Entry criteria required that patients had a diagnosis of NDO with involuntary detrusor contractions with detrusor pressure increase greater than 15 cm H2O and that patients or their caregivers practiced clean intermittent catheterization (CIC).

A systemic review and network meta-analysis compared the efficacy and tolerability of mirabegron compared with antimuscarinic monotherapy or combination therapies for overactive bladder. A total of 64 studies (n = 46 666) were included in the network meta-analysis. Mirabegron 50 mg was significantly more efficacious than placebo for all efficacy endpoints. Comparable overall efficacy was observed for mirabegron 50 mg versus most active treatments, but solifenacin 10 mg monotherapy and solifenacin 5 mg plus mirabegron 25 or 50 mg in combination were more efficacious for some/all outcomes. Mirabegron 50 mg was significantly better tolerated regarding dry mouth, constipation, and urinary retention than 21/22, 9/20, and 7/10 active comparators,

respectively. Of note, the risk of dry mouth with mirabegron 50 mg was similar to that of placebo (OR: 0.82 [95% CrI: 0.65, 1.03]) and significantly lower compared with all other active treatments except for oxybutynin immediate release (IR) 5 mg (OR: 2.99 [95% CrI: 0.68, 13.75]). Moreover, mirabegron was significantly better tolerated compared with oxybutynin IR for withdrawal due to any reason (OR: 2.14 [95% CrI: 1.36, 3.37]) and placebo for withdrawal due to lack of efficacy (OR: 1.95 [95% CrI: 1.21, 3.24]

Study Summary Table:

Parameter	SCORPIO		ARIES		CAPRICORN			BESIDE	
	Placebo	50 mg	Placebo	50 mg	Placebo	25 mg	50 gm	Placebo	Solifenacin 5mg + MYRBETRIQ 25mg/50mg
Number of Incontinence Episodes per 24 hours (restricted to patients with at least 1 episode at baseline)									
n	291	293	325	312	262	254	257	704	706
Baseline (mean)	2.67	2.83	3.03	2.77	2.43	2.65	2.51	3.15	3.24
Change from baseline (adjusted mean)	-1.17	-1.57	-1.13	-1.47	-0.96	-1.36	-1.38	-1.53	-1.80
Difference from Placebo (adjusted mean)	-	-0.41	-	-0.34	-	-0.40	-0.42	-	-0.26
P-value (95% CI)	-	0.003 (-0.72, -0.09)	-	0.026 (-0.66, -0.03)	-	0.005 (-0.74, -0.06)	0.001 (-0.76, -0.08)	-	(-0.47, -0.05)
Number of Micturitions per 24hrs									
n	480	473	433	425	415	410	426	704	706
Baseline (mean)	11.71	11.65	11.51	11.80	11.48	11.68	11.66	8.90	9.13
Change from baseline (adjusted mean)	-1.34	-1.93	-1.05	-1.66	-1.18	-1.65	-1.60	-1.14	-1.59
Difference from Placebo (adjusted mean)	-	-0.60	-	-0.61	-	-0.47	-0.42	-	-0.45
P-value (95% CI)	-	<0.001 (-0.90, -0.29)	-	0.001 (-0.98, -0.24)	-	0.007 (-0.82, -0.13)	0.015 (-0.76, -0.08)	-	(-0.67, -0.22)
Volume Voided (mL) per Micturition									
n	480	472	433	424	415	410	426	682	680
Baseline (mean)	156.7	161.1	157.5	156.3	164.0	165.2	159.3	170.92	172.93
Change from baseline	12.3	24.2	7.0	18.2	8.3	12.8	20.7	16.52	28.05

(adjusted mean)									
Difference from Placebo (adjusted mean)	-	11.9	-	11.1	-	4.6	12.4	-	11.52
P-value (95% CI)	-	<0.001 (6.3, 17.4)	-	0.001 (4.4, 17.9)	-	0.15 (-1.6, 10.8)	<0.001 (6.3, 18.6)	-	(6.06, 16.99)

Study 9		
Parameter	Children 3-11 (n=43), Mean (s.d.)	Children 12-17 (n=25), Mean (s.d.)
Bladder Compliance (mL/cm H_2O)		
Baseline	16.0 (55.8)	11.1 (10.7)
Change from baseline	14.6 (42.1)	13.6 (15.0)
95% CI	(-0.3, 29.5)	6.7, 20.4
Number of Overactive Detrusor Contractions		
Baseline	3.0 (4.0)	2.1 (3.1)
Change from baseline	-1.9 (4.2)	-0.8 (3.9)
95% CI	-3.3, -0.4	-2.5, 0.9
Bladder Volume Prior to First Detrusor Contraction		
Baseline	115 (83)	177 (117)
Change from baseline	93 (88)	121 (160)
95% CI	64, 122	54, 189
Number of Leakage Episodes per Day		
Baseline	2.8 (3.7)	1.8 (1.7)
Change from baseline	-2.0 (3.2)	-1.0 (1.1)
95% CI	-3.2, -0.7	-1.5, -0.5

Adverse Effects[1,2]

- Adverse Reactions:
  - Severe:
    - Cardiovascular: Hypertension (8% to 11%); 24-hour average increase in SBP compared to placebo were 3.0, 5.5, and 9.7 mmHg for the 50 mg, 100 mg, & 200 mg doses, respectively
  - Moderate:
    - Genitourinary: Cystitis (2%), urinary tract infection (3% to 6%)
    - Neuromuscular: Arthralgia (2%), back pain (3%)
    - Infection: Influenza (3%)
  - Mild:
    - Nervous system: Dizziness (1% to 3%), headache (2% to 4%)
    - Respiratory: Nasopharyngitis (4%), sinusitis (3%)
    - Gastrointestinal: Abdominal pain (1%), constipation (1% to 3%), diarrhea (2%), xerostomia (3% to 4%)

Precautions & Contraindications[1,2]

- Precautions:
  - Concerns related to adverse effects:
    - Angioedema: Immediately discontinue and institute supportive care if the tongue, hypopharynx, or larynx is involved
  - Disease-related concerns:
    - Hepatic impairment: Use with caution in patients with mild to moderate hepatic impairment; dosage adjustment is required in patients with moderate hepatic impairment. Use is not recommended in severe hepatic impairment.
    - Hypertension: Use with caution if used in patients with controlled and less severe hypertension; use is not recommended in patients with uncontrolled hypertension.
      - Blood pressure increases are larger in younger children (ages 3 to <12 years) compared to older children and adolescents (12 to <18 years). Use is not recommended in pediatric patients with severe uncontrolled hypertension (SBP and/or DBP >99th percentile plus 5 mm Hg for age, sex, and stature).
    - Renal impairment: Use with caution in patients with renal impairment; dosage adjustment is required in patients with severe renal impairment. Use is not recommended in ESRD.
  - Dosage form specific issues:
    - Product interchangeability: ER granules and ER tablets are not interchangeable; do not combine products to achieve a total dose. Select appropriate product based on patient's indication and weight; ER granules are not approved for adult use (recommended dose not determined)
  - Medication Safety Issues:
    - Mirabegron is identified in the Screening Tool of Older Person's Prescriptions (STOPP) criteria as a potentially inappropriate medication in older adults (≥65 years of age) with QTc prolongation or hypertension (labile or severe)
    - The Institute for Safe Medication Practices (ISMP) includes this medication among its list of drugs (pediatric liquid medications requiring measurement) which have a heightened risk of causing significant patient harm when used in error (High-Alert Medications in Community/Ambulatory Care Settings)
- Contraindications:
  - Hypersensitivity to mirabegron or any component of the formulation (see package insert)
- Monitoring:
  - Monitor blood pressure at baseline and then periodically during therapy (especially in patients with preexisting hypertension, even if controlled); postvoid residual urine volume at baseline and as clinically indicated thereafter; signs and symptoms of urinary retention
- Pregnancy:
  - Adverse effects have been observed in some animal reproduction studies
- Breastfeeding:
  - It is not known if mirabegron is present in breast milk. According to the manufacturer, the decision to continue or discontinue breastfeeding during therapy should take into account the risk of infant exposure, the benefits of breastfeeding to the infant, and benefits of treatment to the mother

- Pediatric Use:
    - The safety and effectiveness have been established only for the following pediatric indications:
        - Mirabegron: Treatment of neurogenic detrusor overactivity (NDO) in pediatric patients 3 years of age and older and weighing 35 kg or more.
        - Mirabegron granules: Treatment of neurogenic detrusor overactivity (NDO) in pediatric patients 3 years of age and older

Drug Interactions[2]

- Risk C: Monitor Therapy
    - CYP2D6 substrate:
        - Metoprolol: caution
        - Desipramine: caution
        - Digoxin, warfarin, aripiprazole, atomoxetine, amitriptyline, carvedilol, clozapine, codeine, haloperidol, flecainide, propafenone: monitoring and/or dose adjustments

Dosage & Administration[1,2]

- Formulation:
    - Granules for oral suspension: pediatric patients ≥3 years of age; this form of this drug is not approved for use in adults.
    - Tablets: Adults and pediatric patients ≥3 years of age weighing ≥35 kg
    - Note: Extended-release tablets and extended-release granules are not bioequivalent and cannot be substituted on a mg:mg basis; do not combine dosage forms to achieve a specific dose
- Administration & Preparation:
    - Adult: Administer tablet without regard to food; swallow whole with water; do not chew, divide, or crush.
    - Pediatric:
        - Tablet: Administer with food. Swallow the tablet whole with water; do not chew, divide, or crush
        - Granules: Administer with food. Before use, shake bottle for 1 minute, then let stand until foam has dissipated. Measure dose using an accurate measuring device, use dose within 1 hour of measuring. If bottle not used for ≥2 days, bottle should be shaken vigorously for 1 minute each day not used.
        - Tap bottle several times to loosen granules. Add 100 mL of water to the bottle and shake vigorously for 1 minute; let stand for 10 to 30 minutes; shake vigorously for 1 minute again. If granules have not dispersed, shake vigorously for another 1 minute. Resultant concentration is 8 mg/mL.
    - Missed dose: Administer dose as soon as remember if ≤12 hours since missed dose; if >12 hours have passed, skip dose and administer next dose at usual time.
- Dosing:
    - Adult: Overactive bladder
        - Oral: Initial: 25 mg once daily. May Increase to 50 mg once daily after 4 to 8 weeks based on response and tolerability

- Note: May be used as monotherapy or in combination with an antimuscarinic agent

- Adult: Altered Kidney Function
  - EGFR >30 mL/min/1.73m2: Oral: No dosage adjustments necessary
  - EGFR 15 to <30 mL/min/1.73m2: Oral: Do not exceed 25 mg once daily
  - EGFR <15 mL/min/1.73m2 or dialysis, CRRT: Oral: Not recommended
- Adult: Altered Liver Function
  - Mild impairment (Child-Pugh class A): Oral: No dosage adjustments necessary
  - Moderate impairment (Child-Pugh class B): Oral: Do not exceed 25 mg once daily
  - Severe impairment (Child-Pugh class C): Oral: Not recommended

- Pediatric (≥3 years and Adolescents): Neurogenic detrusor overactivity
  - 11 to <22 kg: Oral: Granules: Initial 24 mg once daily; after 4 to 8 weeks of therapy, may increase dose if needed to a maximum dose of 48 mg/day once daily
  - 22 to <35kg: Oral: Granules: Initial 32 mg once daily; after 4 to 8 weeks of therapy, may increase dose if needed to a maximum dose of 64 mg/day once daily
  - ≥35 kg: Oral
    - Granules: Initial 48mg once daily; after 4 to 8 weeks of therapy, may increase dose if needed to a maximum dose of 80mg/day once daily
    - Tablets: Initial 25 mg once daily; after 4 to 8 weeks of therapy, may increase dose if needed to a maximum dose of 50 mg/day once daily
  - Pediatric: Altered Kidney Function
    - EGFR >30 mL/min/1.73m2: Oral: No dosage adjustments necessary
    - EGFR 15 to <30 mL/min/1.73m2: Oral:
      - 11 to <22 kg: Granules: Do not exceed 24 mg once daily
      - 22 to <35kg: Granules: Do not exceed 32 mg once daily
      - ≥35 kg:
        - Granules: Do not exceed 48 mg once daily
        - Tablets: Do not exceed 25 mg once daily
    - EGFR <15 mL/min/1.73m2 or dialysis, CRRT: Oral: Not recommended
  - Pediatric: Altered Liver Function
    - Mild impairment (Child-Pugh class A): Oral: No dosage adjustments necessary
    - Moderate impairment (Child-Pugh class B): Oral:
      - 11 to <22 kg: Granules: Do not exceed 24 mg once daily
      - 22 to <35kg: Granules: Do not exceed 32 mg once daily
      - ≥35 kg:
        - Granules: Do not exceed 48 mg once daily
        - Tablets: Do not exceed 25 mg once daily
    - Severe impairment (Child-Pugh class C): Oral: Not recommended

Cost Comparison

	Mirabegron (MYRBETRIQ geq)	Comparable Medication: **Oxybutynin (Ditropan geq)**
WAC	25mg ER tabs: $397.69/ 30 count 50mg ER tabs: $397.69/ 30 count (contract pricing available) 8mg/mL granules: $231/ 100mL	10mg XR tab: $25/ 100 count 15mg XR tab: $25/ 100 count 5mg IR tab: $25/ 100 count 5mg/5mL suspension: $17.25/ 473mL (contract pricing available)

Recommendation[1-2, 8]:

Mirabegron is a β3-adrenergic receptor agonist approved for the treatment of overactive bladder (OAB) in adults, as well as neurogenic detrusor overactivity (NDO) in pediatric patients aged 3 years and older weighing at least 35 kg. It is available in extended-release tablets and granule formulations, administered once daily, with specific dosing adjustments required for renal and liver impairments.

Mirabegron has demonstrated effectiveness for treatment of NDO in pediatric patients and managing symptoms of OAB, such as urge urinary incontinence, urgency, and urinary frequency, either as monotherapy or in combination with antimuscarinic agents. Existing literature indicates that traditional antimuscarinic therapies offer comparable clinical efficacy in symptom relief.

Mirabegron is commonly used in the community as an alternative or adjunct to antimuscarinic therapy in patients who have contraindications or intolerance to antimuscarinics, or who have persistent symptoms or lack of effective with optimized antimuscarinic therapy. Current practice is to discontinue this medication on admission if patient is unable to supply, which could cause recurrence of symptoms or polypharmacy on transitions of care if an alternative agent is required while hospitalized

Formulary alternative oxybutynin is included on the BEERS list of medications with strong anticholinergic properties, and should be avoided in elderly patients. Mirabegron provides the benefit of fewer anticholinergic side effects and increased tolerability compared to antimuscarinic agents, but does come with other potential safety concerns. Common adverse effects include hypertension, affecting 8-11% of users, which poses a potential increased risk for older adults, many of whom may already have underlying cardiovascular issues which may be exacerbated in the acute inpatient setting. Due to the potential for elevated blood pressure, careful monitoring is crucial, especially in patients over 65 years - who often constitute the majority of those with comorbid OAB.

The acquisition cost for mirabegron, including generic equivalents, is substantially higher than oxybutynin at $10-15 per day. In contrast, oxybutynin, the current formulary treatment for OAB and NDO at Munson Medical Center, is more cost effective at less than $1 per day.

Vibegron (Gemtesa) is the only other beta-3 agonist approved in the US for the treatment of OAB. Adverse blood pressure effects were not noted in clinical trials with vibegron, and hypertension is not included as a warning in the package labeling, however it is noted as an adverse reaction at an incidence rate of 9%. No head-to-head studies exist comparing vibegron to mirabegron. Vibegron is available as branded product only (Gemtesa) and cost is approximately 25% higher than mirabegron.

Recommendation: add mirabegron 25mg and 50mg to the Munson Healthcare inpatient formulary for continuation of therapy for patients receiving this agent in the outpatient setting. Oxybutynin should remain the preferred agent for initiation in the hospital due to cost and more rapid time to maximum effectiveness. However, mirabegron may be considered for patients with contraindications to oxybutynin or in whom anticholinergic effects should be avoided. Orders for vibegron would be automatically substituted to mirabegron 25mg daily.

References:

1. MRBETRIQ (Mirabregon) Oral, Granules [prescribing information]. Northbrook, IL: Astellas Pharma US, Inc; June 2012
2. Lexi-Drugs. Lexicomp Online [database online]. Hudson, OH: Lexicomp, Inc. http://online.lexi.com. Updated periodically. Accessed September 2024
3. Khuller V, Amarenco D, Angulo JC, et al. Efficacy and tolerability of mirabegron, a β(3)-adrenoceptor agonist, in patients with overactive bladder: results from a randomised European-Australian phase 3 trial. *Eur Urol.* 2013 Feb;63(2):283-95. doi: 10.1016/j.eururo.2012.10.016
4. Nitti VW, Auerbach S, Martin N, et al. Results of a Randomized Phase III Trial of Mirabegron in Patients with Overactive Bladder. *J Urol*. 2013 Apr;189(4):1388-1395. doi: 10.1016/j.juro.2012.10.017
5. Herschorn S, Barkin J, Castro-Diaz D, et al. A phase III, randomized, double-blind, parallel-group, placebo-controlled, multicentre study to assess the efficacy and safety of the beta adrenoreceptor agonist, mirabegron, in patients with symptoms of overactive bladder. *Urology*. 2013 Aug;82(2):313-20. Doi: 10.1016/j.urology.2013.02.077
6. Baka-Ostroowska M, Bolong DT, Persu C, et al. Efficacy and safety of mirabegron in children and adolescents with neurogenic detrusor overactivity: An open-label, phase 3, dose-titration study. *Neurourol Urody*n. 2021 Aug;40(6):1490-1499. doi: 10.1002/nau.24657
7. Kelleher C, Hakimi Z, Zur Z, et al. Efficacy and Tolerability of Mirabegron Compared with Antimuscarinic Monotherapy with Antimuscarinic Monotherapy or Combination Therapies for Overactive Bladder: A Systematic Review and Network Meta-analysis. *Eur Uro*. 2018 Sep;74(3):324-333. doi: 10.1016/j.eururo.2018.03.020
8. Mirabegron Extended-Release Tablets (Myrbetriq): Treatment of Overactive Bladder (OAB) with Symptoms of Urgency, Urgency Incontinence and Urinary Frequency [Internet]. Ottawa (ON): *Canadian Agency for Drugs and Technologies in Health*; 2015 Jul. 3, RESULTS. Available from: https://www.ncbi.nlm.nih.gov/books/NBK349262
9. The 2023 American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2023;1-30. doi:10.1111/jgs.18372

M. Drug Shortages

November 21st, 2025

Drug Name	Strength	Dosage Form	Notes	**Estimated** date of Recovery	Safety Memo
Hydromorphone	0.5mg/0.5mL	Inj	Allocated	Intermittent availability	
Omnipaque	All	Vial	Working with vendor for direct orders		
Triamcinolone	40mg/1mL	Vial	Purchasing through alternative vendors	December 2025	

O. Interventions

Carol Coffman

Pain Management

Kalkaska post op- shoulder replacement- elderly, opioid naive. Order for oxycodone 5mg q4h scheduled and 5mg q4hprn. Changed to 5-10mg po q4hprn, try 5mg first, increase to 10mg if needed.

Alyssa DiMondo

Medication History

Provider entered home med orders based on old/prior documentation. Contacted provider when med hx was updated due to 3 medication dose changes. Provider approved changing orders to reflect new home doses.

Samantha Dzierzyc

Medication Clarification

Patient noted to be a clopidogrel non-responder and needs ticagrelor. Ticagrelor order d/c, clopidogrel continued. Clarified with provider, switched order back to ticagrelor 90 mg bid and d/c clopidogrel.

Dana Ferrand

Drug Therapy Optimization

Patient admitted for new onset seizures, abnormal brain MRI, later requiring craniotomy. Hospitalist ordered Imitrex once for migraine. Contacted about risk of lowering seizure threshold and recommended deferring to Neuro team for recs/evaluation.

Alisa Siebenmorgan

Drug Therapy Optimization

Provider noted to discontinue Solu-Medrol in progress note, however the medication continued into the following morning. Followed up with provider if discontinuing the medication was still the plan. Discontinued Solu-Medrol after confirmation with provider.

Michelle Stocking

Medication Clarification

Infant had previous order for methadone 0.14mg q 6hr which was discontinued and new order for methadone 0.14mg q 12hr. New order had dose scheduled 3 hours after last dose. Called provider and spaced out dose by 12hrs

Tricia Strom

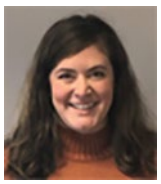
Antidote Recommendation

When informed of a glyburide induced hypoglycemia recommended treatment with octreotide. gave dose in ER- hypoglycemia resolved. admission prevented.

Mark Suitor

Drug Therapy Optimization

94 y/o with methocarbamol 500mg tid prn muscle spasms ordered. Medication is not recommended in elderly, so advised if pt really needed med to reduce dose to 250mg to start and reassess. Suggestion accepted, provider changed dose.



Caitlin Taylor

Discharge Assistance

Provider ordering buprenorphine at discharge for a patient that would be safer discharging on suboxone. called outpatient rx to confirm availability, contacted provider to discuss order. Order for suboxone sent to rx.

Ashley Wischmeyer

Medication Clarification

Propranolol 60 mg TID order w/ admission. Reviewed patient's med history, pt takes propranolol 10 mg daily at home. Discussed with physician, who misread home med list as propranolol 180 mg daily (fill quantity for #180). Order changed to 10 mg TID.