Adult ICU Neuromuscular Blocker Continuous Infusions in Mechanically Ventilated Patients

CPG 0015 Rev: 4/6/22 One Pager 7/9/22 (C. Little/J. DeVries)

This guideline applies to mechanically ventilated adult ICU patients at UMass Memorial Medical Center.

Neuromuscular Blocking Infusion Algorithm

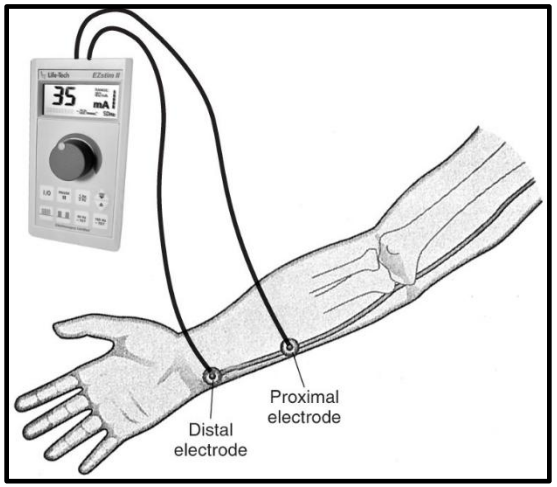
- ☐ Sedation: always sedate prior to initiation of infusion. Never stop continuous sedation prior to discontinuation of the NMB. Administer and titrate to RASS score, typically -4 to -5.
- ☐ Train of Four (TOF): Baseline TOF (called the supramaximal stimulus) and then reassess 4 hrs after initial bolus and/or start of infusion and then per titration table thereafter.
- ☐ Clinical Assessment: should be performed using parameters that are consistent with the indication for the neuromuscular blocking infusion. If the clinical assessment suggests that the patient is not appropriately paralyzed, the drip rate should be titrated or tapered as described in the dosing algorithm. Changes in the infusion rate should be assessed and documented. Adjustments to the treatment plan should be made until unit specific clinical endpoints are achieved. (See chart to right).
- ☐ Daily interruption of neuromuscular blocking infusions
  - NBM holiday/reduction is recommended to be done every day ideally in the morning.

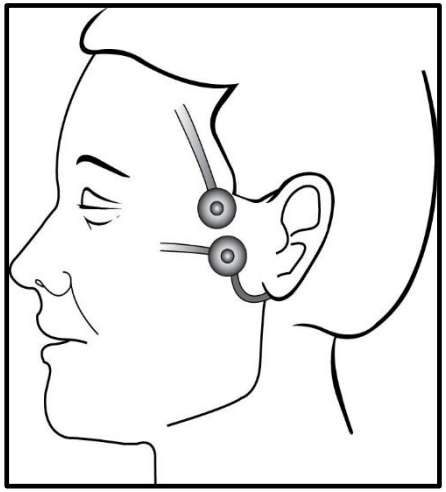
Common Medications

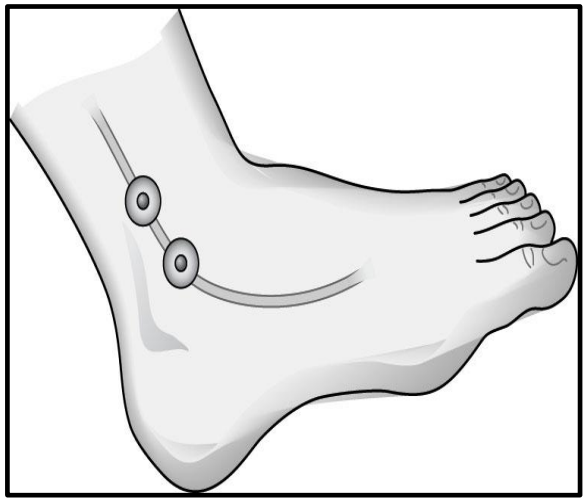
Cisatracurium (Nimbex)- Preferred agent in pt with renal/hepatic dysfunction or when using for ARDS.
Vecuronium- should be used in pt without hepatic dysfunction. Monitor Renal function, CPK.
Lacri-Lube (Mineral oil ophthalmic ointment)- to be used on the eyes as a lubricant to protect against corneal abrasion.

Number of Twitches Present (on a scale from 0-4)	Control of Clinical Assessment Endpoint(s)	Change in Neuromuscular Blockade Dose
0	Achieved	Stop infusion, reassess train-of-four every hour Restart when: • 2 twitches reemerge 1 hour later - 75% of previous rate • 2 twitches reemerge 2 hours later - 50% of previous rate • 2 twitches reemerge 3 hours later - 25% of previous rate • 2 twitches reemerge 4 hours later - 12.5% of previous rate
0	Poor Control	Consider alternative strategy to achieve clinical endpoints
1	Achieved	Stop infusion, reassess train-of-four every hour Restart at 75% of previous rate when 2 twitches reemerge
1	Poor Control	Consider alternative strategy to achieve clinical endpoints Alternatively, increase infusion rate by 25% and reassess train-of-four within 4 hrs
2	Achieved	Maintain present infusion rate Reassess train-of-four within 6 hours
2	Poor Control	Reload with 25% of loading dose Maintain present infusion rate Reassess train-of-four within 4 hours
3	Achieved	Maintain present infusion rate Reassess train-of-four within 6 hours
3	Poor Control	Reload with 25% of loading dose Increase infusion rate by 25% Reassess train-of-four within 4 hours
4	Achieved	Maintain present infusion rate Reassess train-of-four within 6 hours Consult MD about stopping the infusion
4	Poor Control	Reload with 50% of loading dose Increase infusion rate by 50%

Train of Four (TOF): uses to monitor neuromuscular function by evaluating the contractile response of a muscle to a supramaximal stimulus of a peripheral nerve. The TOF administers 4 stimuli every 0.5 sec. Each stimulus causes the muscle to contract. The NMB agents cause a progressive decline in response beginning with the 4th stimulus. When only one twitch is detected, the neuromuscular blockade is 90-95%.







Electrode site placement for TOF: ulnar nerve, temporal nerve, and posterior tibial

Place negative lead: near palm in wrist; near tragus of the ear; or posterior to medial malleolus.

Clinical Endpoint is described in the provider order as below.

Neuro/Cognitive Assessment (Train-of-Four)	As needed, Starting on Wed 7/13/22 at 1520, Until Specified What is your clinical end point: Ventilator compliance, respiratory effort, oxygenation Assess Train-of-Four 4 hours after the initial bolus and/or start of the infusion, then per titration table thereafter.

Emergency Release of Blood Products Tip Sheet

Please reference policy #2238 for full policy

Initiate the request for Emergency Release of Blood Products

a. **Notify the Blood Bank by phone of the need for emergency release blood products.**
b. **Provider enters order in EPIC for "emergency release of blood products"**
- can be entered by MD, PA, NP, CRNA but Attending needs to be listed as authorizing provider and order is eventually co-signed by Attending

- The order allows the blood bank to release product prior to receiving type and cross but type and cross should be drawn and sent as soon as possible

- Downtime Form #NS BB 0105, Request for Emergency Release of Blood Products, is completed and delivered to the Blood Bank if the order is not able to be placed electronically

Receiving Blood from Blood Bank

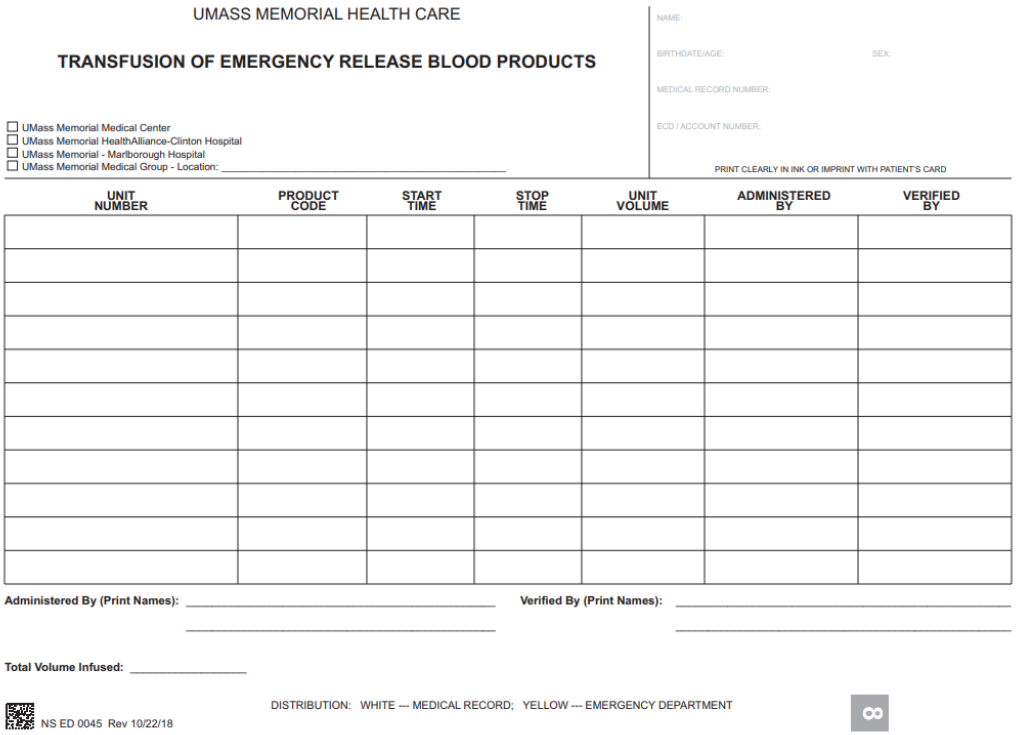
a. **Once order received, blood bank will release product by either tube system or can send a runner to pick up (bring a patient label with you)**
b. **Multiple units of PRBC and thawed plasma can be issued in blood bank cooler**

- Group O PRBC and Group A thawed Plasma is issued for transfusion if the patient's blood type is unknown

c. **Blood bank coolers may only be transported with the identified patient between trauma room, OR, ICU, IR, maternity center, and/or PACU**
d. **Any product in cooler that is not transfused must be immediately returned to blood bank**

Documenting Emergency Release Blood Transfusion

a. **Documentation of the transfusion is recorded on Form NS ED 0045 Transfusion of Emergency Release Blood Products *see below for example** (you can use the sticker from the product bag to place on the form instead of transcribing each unit number, etc.)



UMASS MEMORIAL HEALTH CARE

TRANSFUSION OF EMERGENCY RELEASE BLOOD PRODUCTS

NAME:

BIRTHDATE/AGE: SEX:

MEDICAL RECORD NUMBER:

ECD / ACCOUNT NUMBER:

PRINT CLEARLY IN INK OR IMPRINT WITH PATIENT'S CARD

☐ UMass Memorial Medical Center
☐ UMass Memorial HealthAlliance-Clinton Hospital
☐ UMass Memorial - Marlborough Hospital
☐ UMass Memorial Medical Group - Location: _____

UNIT NUMBER	PRODUCT CODE	START TIME	STOP TIME	UNIT VOLUME	ADMINISTERED BY	VERIFIED BY

Administered By (Print Names): _____ Verified By (Print Names): _____

_____ _____

Total Volume Infused: _____

NS ED 0045 Rev 10/22/18

DISTRIBUTION: WHITE --- MEDICAL RECORD; YELLOW --- EMERGENCY DEPARTMENT

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Belmont Rapid Infuser

Fever & Sepsis Clinical Practice Guideline for Adult ICU's

Evaluation of Fever and Sepsis in Adult Critically Ill Patients CPG (0024) Revised: 1/14/24
One pager updated 6/6/25: (C. Perkins)

Definition of Fever

- ☐ Elevation of an individual's core body temperature significantly above baseline due to an endogenous inflammatory mediator (no precise body temperature defines a fever)
- ☐ A reasonable definition of fever for critical care setting is a single body temperature of 38.3 degrees Celsius or a sustained temperature elevation of at least 38 degrees Celsius for at least 1 hour

Fever and Sepsis

- ☐ Common in critically ill patients
- ☐ Requires prompt clinical evaluation
- ☐ Base laboratory testing and imaging on clinical evaluation
- ☐ Utilize Adult Severe Sepsis & Septic Shock Guideline for patients meeting criteria.

Evaluation Process		
Focused History & Physical Examination	Assess respiratory changes, new murmurs, abdominal tenderness, skin rashes, joint effusion, limb swelling, meningism signs & symptoms. Evaluate presence of any hardware or wounds, assess all lines and catheters.	
Blood Cultures	**Indications & Technique**	Before antibiotics in febrile/hypothermic hospitalized patients with suspected infections (sepsis, meningitis, pneumonia, etc.). Clean site with alcohol/chlorhexidine and draw 20 – 30 ml from peripheral veins from 2 separate sites. Blood culture collection should be done per nursing blood culture collection procedure.
	Follow-up	Every 48 hours for Staph aureus, Staph lugdunensis, Candidemia until negative. Generally, not needed for gram-negative or streptococcal bacteremia unless concerns for endovascular infections.
Respiratory Evaluation	**Clinical Signs of Pneumonia**	New/progressive infiltrate, fever, leukocytosis/leukopenia, purulent secretions, ventilatory changes
	Diagnostics	Physical exam, chest x-ray, sputum culture, mini-RVP MRSA, Nasal Polymerase Chain Reaction (PCR), cultures, thoracentesis for pleural effusions, extended respiratory virus panel if indicated. Bronchoscopy for immunocompromised or treatment failures
Evaluation of Diarrhea	**Criteria for Stool Testing**	If 3 or more loose or liquid stools per 24 hours (not on stool softeners regimen), fever, bloody/mucoid stools, severe cramping, or signs of sepsis - Stool testing should be performed for Salmonella, Shigella, Campylobacter and STEC. C. difficile testing if antibiotics used in the last 3 months. In immunocompromised hosts stool culture, viral studies, and examination for parasites.
	Nosocomial Diarrhea	After 72 hours of hospitalization. Single stool test for C. difficile PCR with reflex to Glutamate Dehydrogenase (GDH) and toxin.
Urinary Tract Evaluation	**Indications for Cultures**	Clinical suspicion of UTI without a catheter for 2 days. Replace urinary catheter before culture in suspected UTI with chronic indwelling catheters.
Paranasal Sinuses Evaluation		Clinical suspicion of sinusitis – consider CT. Remove nasal feeding tubes if scanning is not possible. Ear, Nose, Throat (ENT) evaluation for immunocompromised patients
Post-operative Fever	**Laboratory & Imaging Studies**	Blood cultures only if sepsis suspected or high risk. Chest radiograph if respiratory symptoms. CT scans not useful in first 48-72 hours unless specific indications
CNS Infection	**Evaluation Steps**	CT head scan before lumbar puncture in focal neurologic findings. Empirical antibiotics if lumbar puncture is delayed. Neurosurgery consultation for suspected brain abscess.
	Tests on CSF	Basic tests: cell counts, glucose, protein, Gram-stain, bacterial cultures, meningitis encephalitis panel. Additional tests based on clinical situation
COVID-19 Considerations		Refer to updated guidelines for evaluation and management
Transplant Recipients	**Early Consultation**	For transplant recipients presenting with signs of sepsis, consider early involvement of transplant infectious disease to guide with appropriate workup and antimicrobial therapy

Adult Severe Sepsis and Septic Shock Guideline

Severe Sepsis and Sepsis Shock CPG (0009) Revised: 7/20/2020 One-page updated 6/6/25 (C. Perkins)

This guideline focuses on early, aggressive antibiotic and resuscitation therapies with rapid source control for severe sepsis and septic shock.
The goal of treatment is to assist with the following timely and aggressive therapeutic interventions:

- ✓ Broad-spectrum antibiotic administration
- ✓ Source control
- ✓ Resuscitation therapies

The three-hour bundle, source control, and initiation of antibiotics are the MOST impactful elements of sepsis care.

CRITERIA FOR DIAGNOSIS OF SEVERE SEPSIS

1. Suspicion or confirmation of infectious process
2. Two or more systemic inflammatory response criteria
3. Systolic blood pressure less than 90 **after** 30ml/kg fluid bolus OR lactate greater than or equal to 2 mmol/L OR evidence of greater than 1 organ dysfunction.

3 Hour Bundle	6 Hour Bundle	Reassessment of volume status and perfusion
Measure lactate level within 3 hours	Apply vasopressors to maintain a MAP of >/= 65 mm/Hg	Repeat focused exam (after initial fluid resuscitation) by independent practitioner including vital signs, cardiopulmonary exam, capillary refill, pulse, and skin findings
• Blood cultures before antibiotics • Administer broad spectrum antibiotics	Re-measure lactate if initial lactate level is elevated above 2mmol/L	***OR two of the following***
Administer an initial fluid bolus of 30 ml/kg crystalloid if patient hypotensive, elevated lactate, &/or vasopressors started	In the event of persistent hypotension (MAP less than 65 or SBP less than 90mm Hg) or if initial lactate was >/= 4, re-assess volume status and tissue perfusion	✓ Measure CVP ✓ Measure ScVO2 ✓ Bedside cardiovascular US ✓ Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge
Address source control	**Address source control**	**Address source control**

ICU Pain / Agitation / Delirium Protocol Update 2026:

Key Nursing Takeaways for Medication Administration & Documentation

Key Principles from CPG 0018: PAD management guidelines for mechanically ventilated adult ICU patients

1. Treat pain first before initiating sedation
2. Maintain the lightest level of sedation that is safe for the patient
3. Avoid benzodiazepines whenever possible
4. Prioritize intermittent bolus dosing over continuous infusions
5. Perform daily sedation interruptions
6. Perform routine down-titration of analgesic and sedative infusions when clinically appropriate
7. Promote early and regular patient mobilization

IVP ORDERS

PRN (*2 types*):

- Type 1: "Bolus PRN dose" – IVP or bolus from bag
- Type 2: "Rescue PRN dose" – IVP or bolus from bag
  - Higher dose and less frequency than regular "BOLUS PRN dose"
  - Use only if two BOLUS PRN doses within 1 hour are ineffective, and before initiating or increasing the infusion
- A separate PRN order is needed for pain related to procedures

LOADING DOSE:

- An optional ONE-TIME dose may be given for acute pain or agitation in patients who should not be started on an infusion immediately
- Ordered to be given **within first 90 MINUTES of protocol initiation** *(must be discontinued if not used)*
- Use of loading dose will NOT apply toward the PRN count for initiating infusion

INFUSION ORDERS

- Initiate infusion **only** after 3 TOTAL PRN doses given within 1 hour without reaching goal
- **Some** patients arriving from procedural or operative areas on continuous opioid infusions may continue and wean per orders

TITRATION (*titrate up*):

- Per Provider order
- Administer boluses per orders before increasing infusion

WEANING (*titrate down*):

- Decrease infusion when down titration ordered and:
  - Patient is at goal score (RASS, CPOT, etc.)

  AND
  - 4+ hours have passed without infusion increases of fentanyl, hydromorphone, or midazolam
  - 2+ hours have passed without infusion increases of dexmedetomidine or propofol
- *Trial only in 6 & 7 ICU*: Reminder will pop up in Epic Flowsheet to consider weaning when appropriate

DAILY INTERRUPTION ORDERS

- Helps patients by minimizing medication buildup even when goals are met; helps wean faster
- Daily interruption based on specific Provider order
  - Order contains directions to either COMPLETE or NOT COMPLETE based on specific criteria
- **SEE REVERSE SIDE FOR DAILY INTERRUPTION GUIDELINES**

REQUIRED RN ASSESSMENT & DOCUMENTATION

- Accompanying score (CPOT, RASS, etc. per MD order) must be charted **TWICE** for **EVERY** IVP or infusion change:
  - Within 1-2 minutes **BEFORE** administration of med (validates reason for dose)
  - Within 15-30 minutes **AFTER** administration for reassessment (shows efficacy of dose)

UMMH ICU Pain, Agitation, Delirium (PAD) Management Update 2026

INFUSION ROUNDING GUIDE FOR DAILY SEDATIVE INTERRUPTION (DSI)

Observe the following rounding rules when:

- ✅ **Performing 50% dose reductions** **OR**
- ✅ **Reinitiating infusion at 50% of prior rate** **AND**
- ✅ **Calculated rate is not a whole number**

ROUNDING RULES

Fentanyl: Round down to nearest **25 mcg/hr**

Hydromorphone: Round down to nearest **0.5 mg/hr**

Midazolam: Round down to nearest **1 mg/hr**

Propofol: Round down to nearest **5 mcg/kg/min**

The lowest allowable infusion rate is the minimum titration increment defined for that medication

- *fentanyl @ 12.5 mcg/hr*
- *hydromorphone @ 0.5 mg/hr*
- *midazolam @ 1 mg/hr*
- *propofol @ 5 mcg/kg/min*

DON'T FORGET

Complete Discontinuation (Turn Infusion OFF)

- Lower infusion doses
- Dexmedetomidine: daily interruption not part of protocol

50% Reduction in Infusion Rate

- Fentanyl: >100 mcg/hr
- Hydromorphone: >2.25 mg/hr
- Midazolam: >4 mg/hr
- Propofol >25 mcg/kg/min

CLINICAL APPLICATION

Example 1: Fentanyl Infusion

125 mcg/hr → DSI (50% reduction) = 62.5 mcg/hr
Apply rounding rule → 50 mcg/hr

If DSI not tolerated:
❖ Give as needed PRNs
❖ Increase infusion if >3 PRNs needed in 1 hr

Example 2: Hydromorphone Infusion

7 mg/hr → DSI (50% reduction) = 3.5 mg/hr
Apply rounding rule → 3.5 mg/hr

If DSI not tolerated:
❖ Give as needed PRNs
❖ Increase infusion if >3 PRNs needed in 1 hr

Example 3: Midazolam Infusion

3 mg/hr → DSI (turn infusion off)

If DSI not tolerated:
❖ Give as needed PRNs,
❖ Restart at 50% of prior rate = 1.5 mg/hr
❖ Apply rounding rule → 1 mg/hr

Now Its Your Turn:

Fentanyl @ 75 mcg/hr
DSI = ?
If not tolerated, what are next steps?

Hydromorphone @ 6 mg/hr
DSI = ?
If not tolerated, what are next steps?

Propofol @ 35 mcg/kg/min
DSI = ?
If not tolerated, what are next steps?

Answer Key:

1. Fentanyl: Turn off infusion; give as needed PRNs, restart @ 25 mcg/hr if > 3 PRNs in 1 hour
2. Hydromorphone: Reduce infusion to 3 mg/hr; give as needed PRNs, increase infusion if >3 PRNs in 1 hour
3. Propofol: Reduce infusion to 15 mcg/kg/min, titrate per orders if DSI not tolerated

Management of Acute Respiratory Distress Syndrome (ARDS)

CPG 0032 revised: 8/2/24 One-pager revised: 6/6/2025 (C.Perkins)

Definition of ARDS

Acute Respiratory Distress Syndrome (ARDS) describes the acute, diffuse, inflammatory pulmonary manifestations of both direct and indirect lung injury.

Acute Respiratory Distress Syndrome: ATS 2024 Definition	
Timing	Within 1 week of a known clinical insult or new or worsening respiratory symptoms
Chest Imaging	Bilateral opacities- not fully explained by effusions, lobar/lung collapse, or nodules *chest x-ray, CT chest, or ultrasound in the hands of experienced provider*
Origin of Edema	Respiratory failure not fully explained by cardiac failure or alternative fluid overload *Objective assessment for alternative encouraged if no clear risk factor present*
Oxygenation	
Non - intubated ARDS	PaO2:FIO2<300mmHg or SpO2:FIO2<315 (if SpO2<97%) *HFNC flow >30 L/min OR NIV/CPAP >5 cmH2O*
Mild	200 < PaO2:FIO2 < 300 mmHg OR 235 < SpO2:FIO2 < 315 (if SpO2<97%)
Moderate	100 < PaO2:FIO2 < 200 mmHg OR 148 < SpO2:FIO2 < 235 (if SpO2<97%)
Severe	PaO2:FIO2 < 100 mmHg OR SpO2:FIO2 < 148 (if SpO2<97%)

2024 UPDATES	
	New ARDS definition to include intubated and non-intubated patients
	Recommendations for the use of corticosteroids in ARDS
	Further validation for the role of VV ECMO in severe ARDS for certain patient populations
	Neuromuscular blockade consideration encouraged in cases of early and severe ARDS
	Further emphasis against the routine utilization of recruitment maneuvers

Management

The primary goal of ARDS management is providing adequate oxygenation and ventilation in a manner which limits the potentially deleterious effects of mechanical ventilation - primarily ventilator induced lung injury. Early intervention is key to improving outcomes. **Strategies below are presented sequentially based on strength of evidence from strongest to weakest.**

- **Low Tidal Volume (LTV) Ventilation** - Targeting 6 ml/kg of Ideal Body Weight (IBW) or less in selected patients
- **Positive End-Expiratory Pressure (PEEP)** - ARDSnet protocol to be driven by ordering provider and respiratory therapy
- **Prone Positioning**
    - May provide increased oxygenation, improved secretion clearance, and improved lung compliance
    - Obtain wound care RN consult & nutrition consult (for nutrition please follow *Nutrition Support Guidelines for the Adult Patient Requiring Prone Positioning* CPG)
    - ABG suggestion: 1-hour after prone, immediately prior to supination, & 4 hours after supine.
    - Consider contraindications (see back)
- **Neuromuscular Blockage (NMB)**
- **Extracorporeal Membrane Oxygenation (ECMO)**
- **Vasodilatory Therapy**
- **Recruitment Maneuvers**

Considerations when Proning

Prior to Initiation

- Notify Respiratory Therapy (RT), Nursing, and unit Nurse Manager regarding care plan
- Place Wound Care consultation
- Place Nutrition Consultation [can continue tube feeds (TF) if tolerated]

Criteria for inclusion:

- P:F <150, PEEP >5 cm H2O, FiO2 > 60%, Tidal Volume (TV) approximately 6mL/kg
- Inability to safely maintain oxygenation goals after 12-24 hours.
- Refractory to optimized initial therapy

Criteria for discontinuation:

- Supine P:F ratio > 150, PEEP < 10, Fio2 < 60% for ≥ 4 hours after last prone position.
- 20% reduction in P:F ratio 1 hour post-prone positioning in comparison to last supine value on 2 consecutive prone sessions.
- Complications requiring immediate interruption include (but not limited to):
    - Accidental extubation, mainstem bronchus intubation, endotracheal tube (ETT) obstruction
    - Hemoptysis
    - O2 saturation < 85% or PaO2 < 55mmHg > 5min while FiO2=1.0
    - Cardiac arrest, HR < 30 BPM for > 1minute, SBP < 60mmHg for > 5 minutes

Contraindications for proning:

- ICP > 30 mm Hg, CPP < 60 mm Hg, MAP < 65 mm Hg
- Weight > 160 kg, Height > 198cm
- Pregnancy
- Bifurcated endotracheal tube, bronchopleural fistula, massive hemoptysis
- Unstable chest wall, sternotomy, open chest
- Tracheal surgery within 15 days, pacemaker insertion within 2 days
- Unstable spine, pelvis, or facial trauma
- Grossly distended abdomen or ischemic bowel
- Extracorporeal membrane oxygenation (ECMO) cannula placement problems

General Considerations

Corticosteroids - Benefits include improved mortality, LOS, and duration of MV spanning a broad base of underlying pathology (ARDS, septic shock, pneumonia) typically present in tandem

Fluid Volume Management

Sedation Strategies - Available literature supports that deep sedation is not required for patients to tolerate LTV or high PEEP strategies, although with an emphasis on NMB for early severe ARDS. Light sedation strategies (RASS -1 - 0) should be pursued for all cases of mild-moderate ARDS unless deep sedation (RASS -5 - -4) is indicated otherwise (ventilator dyssynchrony for example)

Nutrition Management – Consult nutrition when patients are proned; use of enteral nutrition while on NMB is not prohibited despite concerns of decreased peristalsis

PA Catheter Basic Info

Used to help guide interventions in the Heart Failure population on 3 Lakeside SD

Normal Values

PA pressures: 15-30/5-15 (10-20)

PAOP: 8-10

CVP: 2-6

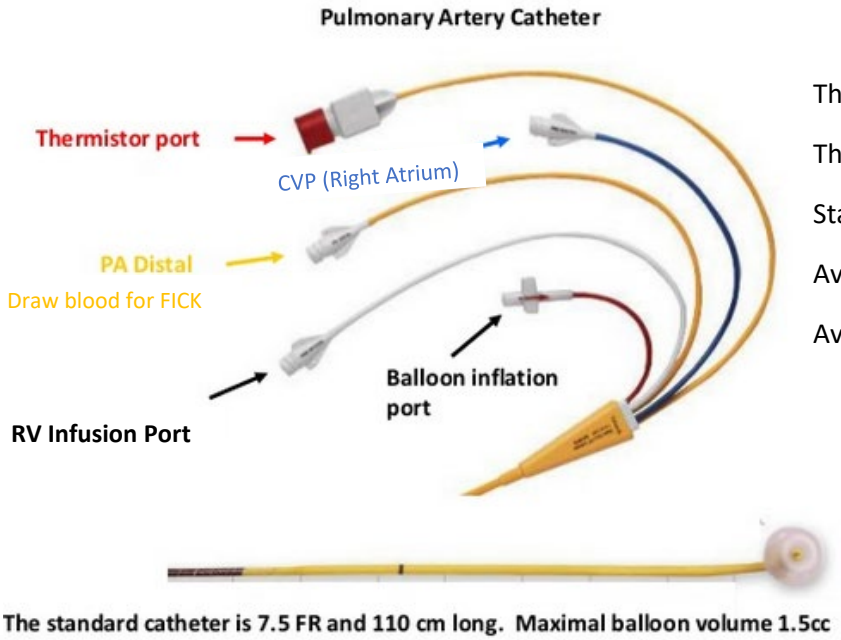
CO: 4-8

CI: 2.5-4

SVR: 900-1600

SVRI: 1970-2390

SvO2: >60%



The standard catheter is 7.5 FR and 110 cm long. Maximal balloon volume 1.5cc

PA Cath Markings

Thick line = 50cm

Thin line = 10cm

Standard Cath: 110cm long

Average for IJ: 45-55cm

Average for Femoral: 75cm

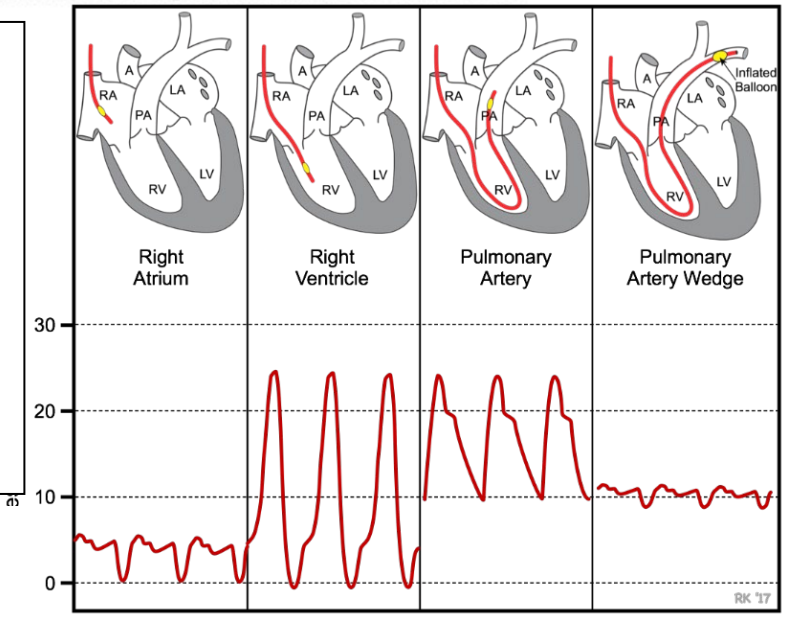
Thermistor Port: Red cap remains on, not used on 3 Lakeside SD

CVP Port: lumen in the RA, OK for intermittent med infusion

PA Distal: Tip of catheter sits in PA, used for mixed venous blood gases, **NEVER** infuse medications

RV Infusion Port: Can be used for medications

Wedge Port: Leave syringe attached and deflated with lock OPEN, syringe holds 1.5ml of air



Reminders

- Zero and level CVP and PA (same as a-line)
- Monitor waveform
- Document the length at the insertion hub each shift, after travel and change in waveform
- Swandom always locked (I=locked, O=open)
- 1.5ml syringe on port with no air and open (lines match up)
- Chest x-ray needed to confirm initial placement and if waveform changes

FICK (wrench into flowsheets)

Needs Sv02 (from PA port), most recent hgb, height cm, weight kg, and O2 sat in decimals (97% = 0.97)

Updated 2022

Prevention of Catheter Related Bloodstream Infection

CPG revised 7/29/2024 Document revised 6/2025 K. Harrington

Central vascular catheter (CVC) and arterial catheter-related bloodstream infections are leading causes of morbidity and mortality in the hospital environment. The use of a standardized organizational approach to central venous and arterial catheter care can markedly decrease the incidence.

Education, Training, and Credentialing

- Education and Consent
  - Education on the prevention of CVC related blood stream infections is provided to patients, and as appropriate, their family, prior to insertion on a non-emergent basis or after emergent placement.
  - Education can be provided at time of informed consent and is documented in the approved electronic medical record format.
- Training of Staff
  - All UMMMC caregivers and outside vendors are required to complete a mandatory educational program.
  - Completion of training will be monitored by the Medical Staff office, the GME office, and Nursing administration.
  - **A second individual who has completed the educational program should be present to assist in the placement of all CVCs**.
  - **Nursing and other support staff are empowered to stop the performance of CVC or arterial catheter procedures when deemed appropriate such as a witnessed break in sterility.**
- Credentialing
  - The second caregiver assisting the procedure must check to verify that either the primary operator or person directly supervising the procedure is credentialed to perform the procedure independently:
  - The individual who assists in the catheter placement will complete the components of the **Quality Assurance (QA) Checklist** for the procedure, completing one QA checklist for each line placed.
    - **Echonet** -for attendings and Advanced Practice Providers
    - **Echonet** – for dynamic access RNs
    - **Echonet-Medhub** for residents and fellows

Catheter Use

- A standardized CVC insertion cart or kit will be maintained in the ICU.
- An antimicrobial coated CVC should be used when available and not contraindicated.
- A standardized antimicrobial impregnated CVC dressing is used throughout the institution, except for the Neonatal ICU.

Blood Cultures

- Blood Cultures in the ICU
  - Perform 2 sets of blood cultures at time of admission on any patient who arrives with a CVC or arterial catheter in place.
  - Blood cultures should not be taken from a Central Line after the insertion sterile field has been removed.
  - Any blood cultures taken after that time should be completed by a strait stick
- Blood Cultures in Acute Care
  - Patients admitted to an acute care unit should have 2 sets of blood cultures performed at the time of admission on a patient who arrives with a central venous catheter in place and is showing signs or symptoms of Systemic Inflammatory Response Syndrome (SIRS)
- Blood cultures that are pending at the time of transitioning to comfort measures only will be automatically canceled at the time of the order.

Access Caps and Alcohol Impregnated Caps

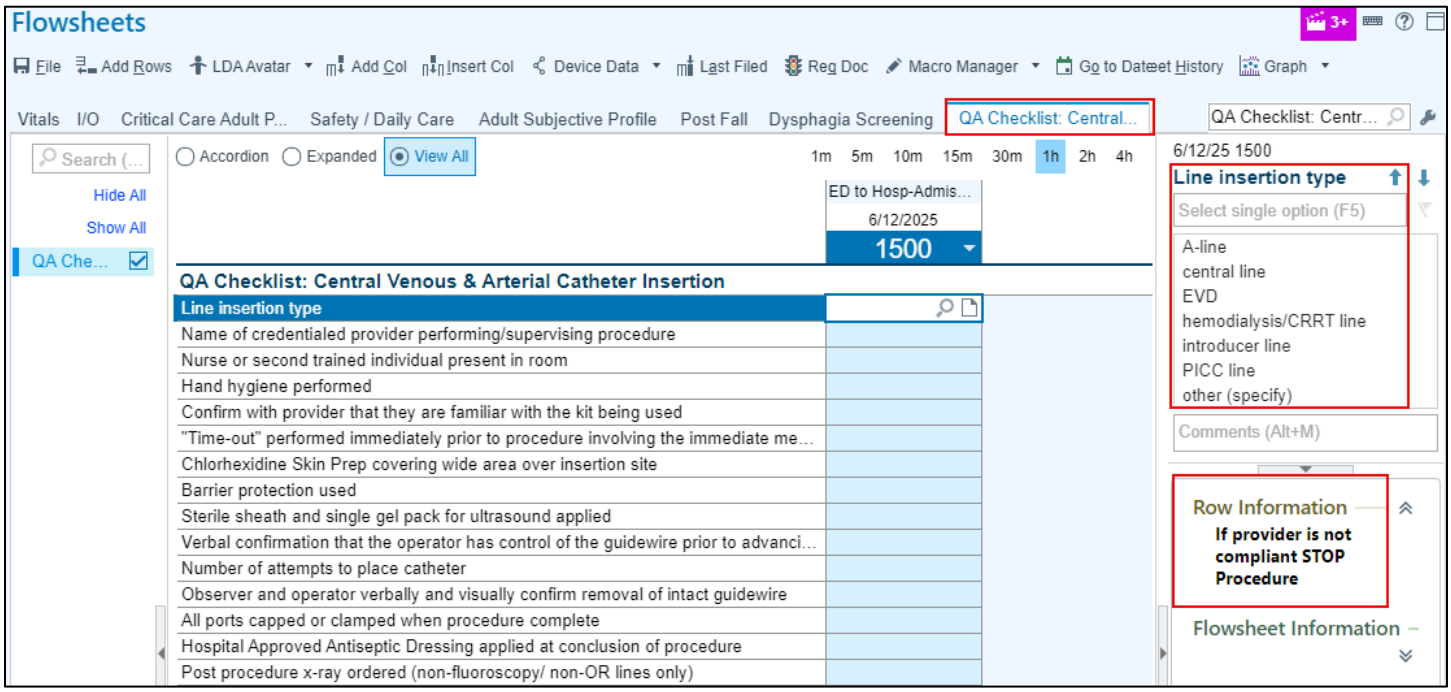
- Access-caps are to be cleaned with 70% alcohol wipes with friction in a circular motion for **15 seconds** and allowed to air dry prior to accessing any intravascular device if alcohol cap has not been in place.
- Access caps are changed every **96 hrs.** or when there are signs of debris, defects or contamination.
- Access caps with Parenteral Nutrition (PN) are changed **daily** with every tubing and filter change.
- **An alcohol impregnated cap is placed on each CVC access port and arterial line access port.**
- **Alcohol caps are changed each time a port is accessed.** ***Refer to hospital policy 2510 - Insertion, Care, and Maintenance of All Intravascular Catheters.***
- The necessity of each central venous or arterial catheter is assessed daily in all patients with such catheters.
- Patients with a CVC, arterial line, or dialysis line will have a daily chlorhexidine bath while an inpatient.

UMass Memorial Health
UMASS MEMORIAL MEDICAL CENTER

QA Checklist: Central Venous & Arterial Catheter Insertion for Nursing

What is the QA Checklist: **Central Venous & Arterial Catheter Insertion?** A free standing flowsheet to assist the user to monitor "high-risk" line insertions, to ensure the quality of line placement and decrease the risk of infection.

What "high-risk" lines should the QA checklist be utilized for: Complete a **separate QA checklist** for each A-line, Central line including introducer, hemodialysis/CRRT line and PICC line and EVD that is inserted. The Line Insertion Type should match the LDA documentation.



Who is responsible to document on the QA checklist: The nurse or second trained individual present in the room as the line is being inserted is responsible to document on this flowsheet

How should the flowsheet be utilized. The user should open the flowsheet in the room **BEFORE** the line insertion starts, and ask all questions out loud as the procedure is occurring. Of note:

- **Before the insertion starts** the user is responsible to confirm the appropriate privileges/credentials of the performing provider, using the EchoNet/Med Hub links in the row information to access the appropriate credentialing system. If the provider is **NOT credentialed**, stop the procedure until a privileged provider is present
- With several of the questions, **the user is responsible to stop the procedure if a break in sterile technique is identified;** the procedure can continue once the deficit is corrected. In these instances, the user should document "no, stop procedure until deficit is corrected".

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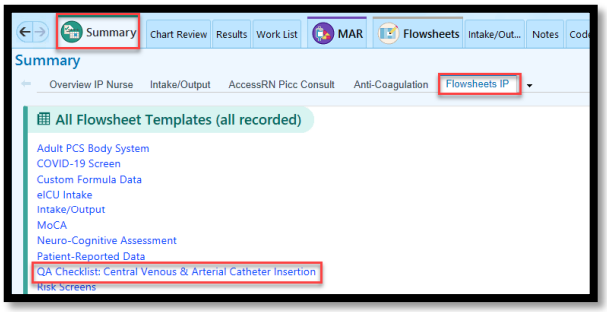
Where can users view the completed documentation in the QA checklist: Information documented in this flowsheet can be found in the "Flowsheet IP" report on the summary tab



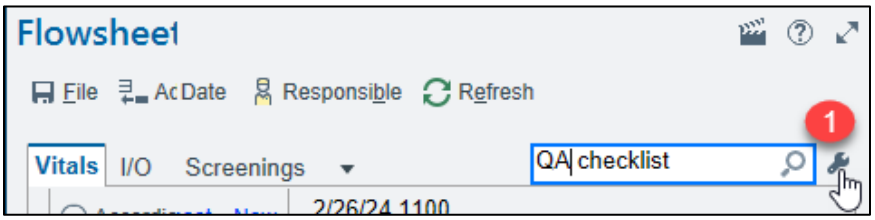
How does inpatient nursing access this flowsheet: The flowsheet is automatically wrenched in for most users; some users that have personalized their flowsheet (overridden the template) will need to wrench it in.

Wrenching in the QA Checklist for ALL patients.

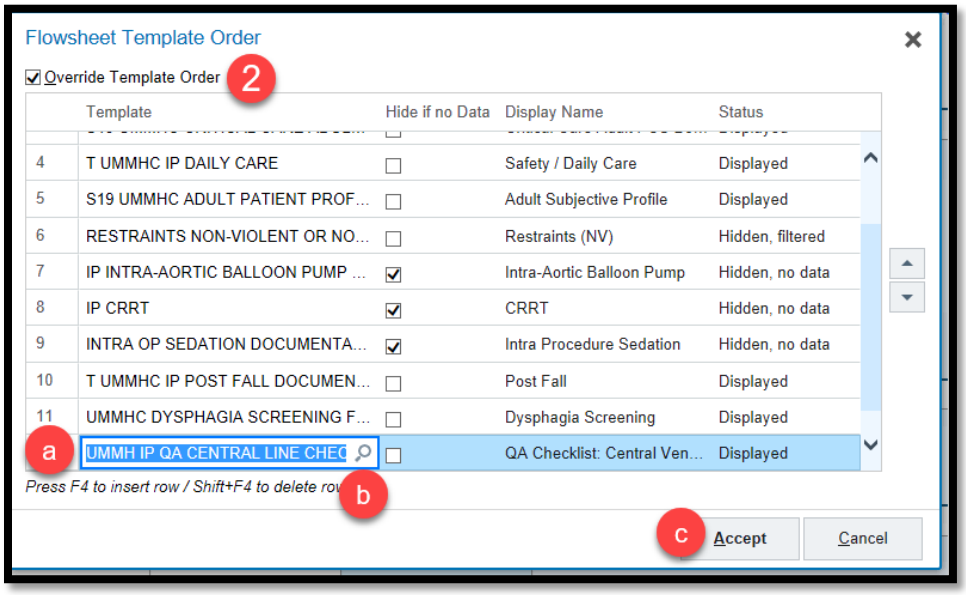
Note: If you currently have the QA Checklist Flowsheet, no further action is required.

Go to the Flowsheet Activity

1. Click the wrench to view the Flowsheet Template Order window



2. If the Override Template Order box is checked:
   a. In an empty cell, type "QA Checklist"
   b. Click the magnifying glass to search for the document
   c. Click Accept



Prevention of Venous Thromboembolism (VTE) in Hospitalized Adults (CPG 0020)

CPG reviewed: 3/30/2022 **One-pager revised: 12/2025 (by B. Matthew)**

- All adult patients should be assessed for VTE and appropriate prophylaxis administered per provider orders.
- Orders for VTE prophylaxis should be reviewed daily on multidisciplinary rounds.
- Chemoprophylaxis is preferred over mechanical prophylaxis whenever possible.
- **Nursing should document sequential compression device (SCD) placement and percentage wear time** (ideal wear time to provide prophylactic benefit is at least 18 hours).
- Barriers to implementing VTE prophylaxis as ordered by providers should be escalated.
- Patients who are not critically ill should undergo risk stratification.
- Hospitalized patients undergoing a surgical procedure should have a Caprini score. determined by providers to determine risk stratification & treatment.
- Termination of prophylaxis may be appropriate when a patient who was previously deemed high-risk for VTE has begun to ambulate regularly (walking >1050 steps/day [~350 feet]).

Contraindications for SCD use:

- Any local condition the sleeve may interfere with - i.e., dermatitis, gangrene, vein ligation, recent skin graft
- Severe arteriosclerosis or ischemic vascular disease
- Massive edema of legs or pulmonary edema from congestive heart failure
- Extreme deformity of leg
- Suspected pre-existing deep vein thrombosis (DVT)

Chemoprophylaxis Options:

Low Molecular Weight Heparin (LMWH)

- Preferred anticoagulant, largely because of evidence that the risk of heparin-induced thrombocytopenia may be lower with LMWH than with unfractionated heparin (UFH).
- The most commonly utilized LMWH at UMMMC is enoxaparin.
- The usual dosing of enoxaparin in medically ill patients is 40 mg subcutaneously (SC) once daily or 30 mg SC once daily if renal impairment is present. Post-operative prophylaxis dose for knee replacement is 30 mcg SC BID and for hip replacement is 40mg SC daily.
- Morbidly obese patients may require 40 mg Q 12 hours.

Unfractionated Heparin (UFH)

- If the risk of bleeding is somewhat elevated, UFH might be considered instead of LMWH due to more complete reversibility and shorter duration of action.
- The usual dose is 5000 units SC three times daily (TID) but smaller doses (5000 units SC BID or 3500 units SC TID) are sometimes used if bleeding is a particular concern, or in very small (<45 kg) or elderly patients.
- Morbidly obese patients may require 7500 units TID.

Patients with Heparin Allergy/History of Heparin Induced Thrombocytopenia (HIT)/Heparin Induced Thrombocytopenia with Thrombosis (HITT)

- Mechanical prophylaxis should be started.
- Anticoagulation service should be consulted for consideration of alternative chemoprophylaxis such as argatroban.

Mechanical

- Mechanical prophylaxis should be strongly considered as an adjunct to anticoagulant-based prophylaxis in high-risk patients or when chemical prophylaxis is prohibited. Document under VTE Prevention/Management section of the Safety/Daily Care flowsheet.
- Inferior vena cava (IVC) filter is also an option when the patient is ineligible for prophylaxis or prolonged bedrest is anticipated.

Inferior Vena Cava (IVC) Filter

- For patients unable to receive either chemoprophylaxis or mechanical prophylaxis, insertion of a retrievable IVC filter should be considered.

Ventilator Associated Pneumonia (VAP): Prevention, Antimicrobial Initiation, and De-escalation Clinical Practice Guideline for Adult ICUs

CPG Revised: 5/5/2021 **One-pager revised 6/2025 M. Sbardella**

Defining VAP

- Invasive mechanical ventilation for greater than 48 hours **&**
- Persistent infiltrate on x-ray appearing after intubation **&**
- **With Either** fever greater than 38, WBC greater than 12k or less than 4K

Must have above three with EITHER:

- Documented evidence of infection on culture **OR**
- Respiratory changes including worsening gas exchange, increased suctioning, new purulent sputum

Prevention of VAP

- Avoid mechanical ventilation
- Follow ICU sedation protocol to prevent self-extubation and prolongation of the weaning process.
- Follow ICU weaning protocol to promote spontaneous breathing trials
- Follow ICU mobility program if appropriate, assign mobility level daily.
- Elevate head of bed (HOB) to 30 degrees or higher, including during transport, All ICU team members are empowered to elevate HOB unless contraindicated.
- Patients should be orally intubated.
- Gastric tubes should be placed orally.
- Provide stress ulcer prevention per provider orders.
- Prevent gastric overdistention & empty stomach contents prior to transport unless contraindicated.
- Provide oral hygiene at least every 8 hours & prn.
- Avoid contamination of ventilator circuit.

Antimicrobial Therapy for VAP

When VAP is suspected follow provider orders for obtaining cultures & administering antibiotic therapy ASAP. Antibiotic coverage should be based on culture results when final. Typical treatment course is 7 days.

Appendix B

GUIDELINE: ORAL CARE FOR INTUBATED OR MECHANICALLY VENTILATED PATIENTS

Purpose:

In ventilated patients, the build-up of oral microorganisms on the dental plaque and the subsequent aspiration of these potential pathogens may contribute to the development of ventilator-associated pneumonia.

Policy

All intubated patients will receive oral care at least every eight hours and as needed. The Chlorhexidine oral rinse, if ordered, is administered following oral care. Chlorhexidine can be used for patients felt to be at high risk of developing VAP.

Procedure

- Equipment: Soft toothbrush, oral swab suction, toothpaste or toothbrush containing an agent which assists in eliminating plaque (sodium bicarbonate, hydrogen peroxide)
- Gloves and eye protection are worn
- Set up suction
- Position patient
- Suction oral secretions and back of mouth.
- Yankauer is replaced every 24 hours at the first oral care procedure of the day.

Provide oral care at least every 8 hours and as needed:

Evaluate the oral cavity to determine if brushing is needed to remove dental plaque.

1. Brush teeth. Gently brush teeth for 1-2 minutes and suction as secretions accumulate.
2. Gently brush tongue.
3. Use an oral swab(s) around the gums, on roof of mouth and under tongue. Use swab(s) for 1-2 minutes as needed. Suction as necessary.
4. Apply hospital approved lip moisturizer. (Do not use Vaseline)
5. Document oral care on flow sheet or on electronic medical record.

Adult Alcohol Withdrawal Guideline

CPG 0011 revised: 2/8/2023 One-pager revised: 6/2025 (C. Perkins)

- ✓ Alcohol Withdrawal Syndrome (AWS) is defined as 2 or more distinguishing symptoms that develop hours to days after a significant decrease in alcohol consumption-typically 6 to 24 hours after last drink.
- ✓ Unrecognized & untreated withdrawal can complicate a patient's illness course
- ✓ This guideline standardizes assessment & treatment of AWS for adults in the emergency department, acute care, & critical care.
- ✓ Assessment and treatment of alcohol use must be individualized and based on the clinical judgement of the ordering provider and the nurse.

Guideline Pearls

- Patient is screened upon admission for alcohol use including
  - Amount & frequency of alcohol used
  - Date & time of last drink
  - Current vital signs
- If the patient reports to consuming alcohol, the nurse will collaborate with ordering provider to determine risk for alcohol withdrawal.
- Either the Audit-C or Cut down, Annoyed, Guilty, and Eye-opener (CAGE) screening tool will be used for patients responding yes, but CAGE tool does not differentiate between active & past alcohol use disorder (AUD).
- Patients are considered at risk with:
  - Use of alcohol within the last 2 weeks
  - Scores 2 or more on the CAGE questions
  - Audit-C screening scores greater than 4 for males or greater than 3 for females
- The Clinical Institute Withdrawal Assessment Scale for Alcohol developed by the Addiction Research Foundation (CIWA-AR) is initiated for assessment of the at-risk patient, along with vital signs. CIWA-AR is accessible in the additional documentation line of the cognitive section of the adult PCS body system flowsheet.
- Intubated intensive care unit (ICU) patients admitted with CIWA scores greater than 20 or with significant history of withdrawal, titrate to Richmond Agitation Sedation Scale (RASS) goal rather than CIWA scoring:
  - Assess RASS every hour.
  - Patients that have a RASS score higher than their goal, assess every 15 minutes until RASS goal is met.

CIWA SCORING

Mild to Moderate Withdrawal

Used with CAGE greater than 3 but CIWA less than 20 & no history of alcohol withdrawal.

If the score is less than 8 for 48 hours & vital signs stable, discuss discontinuing protocol with provider.

If CIWA & vital sign checks are being required hourly, discuss changing to severe scale.

Assessment is based on score:

- ✓ **CIWA less than 8** assess every 2 hours for 24
- ✓ **CIWA 8-15**- reassess in 2 hours (Q 4 hours from 2300-0700 if asleep)
- ✓ **CIWA 16-20**- reassess in 2 hours
- ✓ **CIWA is greater than 20**- reassess hourly

Severe Withdrawal

For patients with score greater than 20 or significant history of withdrawal including delirium tremens & alcohol-related seizures.

Alert provider for: score greater than 20 for more than 1 hour; seizures; delirium; &/or continued elevated vital signs.

Assessment is based on score:

- ✓ **CIWA less than 8** assess every 2 hours for 24 If VS stable & score less than 8, reassess every 4 hours x 24. If score less than 8 for more than 48 hours, discuss protocol with provider.
- ✓ **CIWA 8-15**- reassess hourly
- ✓ **CIWA 16-20**- reassess every 30 minutes
- ✓ **CIWA is greater than 20** reassess every 15 minutes

- ❖ Treatment options include: Diazepam, lorazepam, midazolam, phenobarbital, & propofol for intubated patients. (See provider orders for dosing)
- ❖ Additional treatments include vitamin and electrolyte supplementation, clonidine, dexmedetomidine, & haloperidol.
- ❖ Patients able to take oral meds should have PO meds first.
- ❖ Phenobarbital is the preferred medication with an optional loading dose but can also be used as a rescue method with benzodiazepines. If continued therapy is inadequate, intubation may be required for patient safety.

Adult Guideline for the Reduction of **C**atheter **A**ssociated **U**rinary **T**ract **I**nfections (CAUTI)

CPG Revised: 9/20/2023 Document Revised 6/2025: M. Sbardella

- ✓ Urinary catheters are inserted in more than 5 million people annually.
- ✓ Duration of catherization is the largest risk factor for CAUTI development- up to 25 % of patients with a urinary catheter for more than 7 days develop positive cultures usually representing colonization.
- ✓ Some risk factors for developing CAUTI are modifiable & some are not.
- ✓ The most important steps to minimizing CAUTI is to avoid unnecessary catheter use, remove the catheter ASAP, & use testing that differentiates colonization from infection.

The best way to prevent a CAUTI is to remove the catheter.

Indications for Urethral Catheters:

- Urinary retention or failed voiding trial and intermittent catheterization not possible
- Postoperatively after urethral stenting
- Urethral trauma
- Postoperatively after prolonged urologic or colorectal surgery
- Difficult catheterization per urology
- Open sacral or perineal wounds in incontinent patients
- Unable to use bedpan/commode/external device due to spinal/orthopedic instability
- Hospice or Palliative care for comfort measures
- Chronic urethral catheter on admission
- When accurate urine output measurement is critical & patient unable to use bedpan/commode/external catheter (i.e. active diuresis)
- Clots causing urinary retention
- ICU ONLY: monitoring hourly output, PAD protocol for intubated patients and alternative urine collection not feasible, severe desaturation with movement/*do not turn* order

Urethral catheters are not indicated in the following situations:

- Patients with incontinence (in the absence of sacral wound)
- As a means of obtaining urine for culture (or other diagnostic tests) when the patient can void
- Routinely for patients receiving epidural anesthesia/analgesia
- Patients who can use a urinal, bedpan, etc. and are being actively diuresed
- Commonly performed specific surgical procedures that can be done without urethral catheters, e.g. Cholecystectomy, hernia repair (laparoscopic or open), Appendectomy
- Patients requiring bed rest with no other indications for a urethral catheter placement
- Patients with altered mental status (including intoxicated patients) with no other indicators for urethral catheter placement.
- Patient request is rarely an indication. If this request is granted and local symptoms develop, the catheter should be removed rather than testing performed in almost all instances.

Basic Strategies to Prevent CAUTIs

- **All Orders for placement of a urethral catheter must include an approved indication**. Nursing staff will page the ordering provider if this information is missing.
- Daily assessment of need to continue catheter.
- Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised.
- Attending approval of all urine cultures ordered except at admission.
- Certain measures during the insertion and maintenance of a urethral catheter can help prevent against associated infection.
- Patients transitioned to comfort care with pending urine cultures should have those cultures canceled per provider order.
- **Nurse-Driven Catheter Removal Order** – When the order indicates “RN MAY REMOVE” the RN may discontinue the urethral catheter when the indications for insertion are no longer met. When the provider does NOT want the catheter removed by the RN, the order will say “RN MAY NOT REMOVE”

Adult ICU Glycemic Control Insulin Infusion Guideline

CPG Revised 5/31/2023 Document revised 6/2025 M. Sbardella

The purpose of this one-pager is to ensure safe & effective management of glycemic control in adult ICU patients illustrated in the CPG.

- **This guideline is NOT used in the following circumstances:**
  - ✓ **Acute management of diabetic emergencies such as DKA or HHS**
  - ✓ **Pancreas transplant patients without prior consent from the Pancreas Transplant Team**
- All glucose control guidelines are superseded by this CPG for adult patients.
- Insulin is premixed as 100 units/100ml NS.
- **Insulin bags are changed every 24 hours.**
- A continuous source of dextrose is recommended if an insulin infusion is required (usually IV infusion).
- See chart to right for initiation dosing of infusion.
- For titration once the drip has started, follow the titration table linked in the order on the MAR.

Infusion Initiation Dosing

BG (mg/dL)	Insulin Infusion (units/hour)
> 400	Notify provider to obtain bolus dose order and continuous infusion
351-400	8 units/hour
301-350	6 units/hour
251-300	4 units/hour
201-250	3 units/hour
181-200	1 units/hour
≤ 180	***No IV insulin required***

Nursing Instructions Below

☐ **Standard Monitoring Regimen** (default regimen)		☐ **Type 1 Diabetic Regimen** (Not for use in DKA/HHS)	
Measure BG as below. If two consecutive BG values are > 180 mg/dL, begin insulin infusion (see next section).		Measure BG as below. Begin insulin infusion at _____ units/hr (see next section).	
BG Value (mg/dL)	**Frequency of BG Measurement:**	**BG Value (mg/dL)**	**Frequency of BG Measurement:**
< 70 or > 180	Every 1 hour	< 70 or > 180	Every 1 hour
70 - 180	Every 2 hrs. if in goal range of 110-180 or not requiring insulin x 3 consecutive readings, see next	70 - 180	Every 2 hrs. If not in goal range, resume BG checks as above. Do NOT stop insulin infusion without speaking to provider.
On Insulin: 110 - 180 x 3 consecutive readings	Every 4 hours. If BG out of goal range, resume BG checks as above		
No Insulin: 70-180 x 3 consecutive readings, see below***			
Any decrease or interruption in glucose source (TPN, enteral feeds or IV dextrose	30 minutes after the glucose change, then every 1 hr x 3 BG checks	Any decrease or interruption in glucose source (TPN, enteral feeds or IV dextrose)	30 minutes after the glucose change, then every 1 hr x 3 BG checks
For all ***clinically stable patients NOT requiring IV insulin, continue BG checks per section below: If between 70-180 mg/dL every 4 hrs x 6 consecutive readings, check BG every 12 hrs. If between 70-180 mg/dL every 12 hrs x 2 consecutive readings, then stop BG checks. If at any point the BG > 180 mg/dL (via fingerstick or lab draw), recheck BG in 1 hr and resume the standard or aggressive protocol as ordered above.			

Nursing instructions:
Provider will check either standard or Type 1 for monitoring regimen. Type 1 regimen does **NOT** wean the insulin drip to off.

Follow instructions in box for finger stick blood sugar (FSBS) check schedule.

Never stop an insulin infusion on a type 1 diabetic without consulting the provider.

ICU Hypoglycemia Prevention Protocol

1. Initiate dextrose-containing fluids ordered below for the following:
   a. For patients that are ordered NPO or are on Clear Liquid Diet for > 6 hours
   b. If PO diet, enteral tube feeds, or parenteral feeds are held and/or discontinued
   c. For patients with a hypoglycemic event (BG <70 mg/dL) with ordered:
      i. PO diet
      ii. enteral feeds
      iii. parenteral feeds
      iv. NPO
      v. PO Clears

☐ Patient exempt from Hypoglycemia Prevention protocol

a. Initiate dextrose-containing fluids ordered below for the following:
   - If patient is receiving IV insulin while NPO and not receiving parenteral/enteral nutrition.
   - If tube feeds/TPN are held and/or discontinued while receiving IV insulin, decrease the insulin infusion by 50% and recheck blood glucose.

☐ D5NS at ____ mL/hr
☐ D5W at ____ mL/hr (**DO NOT** use in patients with or at risk for cerebral edema)
☐ D10W at ____ mL/hr (**DO NOT** use in patients with or at risk for cerebral edema)
☐ D10NS at ____ mL/hr (preferred for neurosurgical patients)

The Hypoglycemia Prevention Protocol is included in the order set. Providers should choose either that as the glucose source or choose the exempt from hypoglycemia Prevention Protocol box & choose the backup dextrose source.

Patients starting PO diet

- The nurse checks the FSBS immediately before meals. If the premeal glucose is above 180mg/dL, adjust insulin infusion per CPG.
- When the patient has finished eating, the nurse counts the carbohydrates consumed and administers rapid acting insulin SC per the order set.
- Check FSBS 2 hours after administration of rapid acting SC insulin and adjust insulin infusion per protocol.
- **If the patient is noted to be eating between meals, notify the provider.**

CARBOHYDRATE COUNTING

If a patient resumes an oral diet while continuing to require an insulin infusion, administer a SC dose of insulin lispro (HumaLOG) immediately upon completion of the meal per chart below. Check BG two (2) hours after the administration of SC lispro and adjust the insulin infusion per the titration table.

Amount of Carbohydrates Consumed:	Amount of SC insulin lispro (HumaLOG) to administer:
> 30 grams (> 50% of meal)	3 x current insulin infusion; max 20 units of insulin lispro (HumaLOG)
15-30 grams (25%-50% of meal)	2 x current insulin infusion; max 20 units of insulin lispro (HumaLOG)
< 15 grams (< 25% of meal)	1 x current insulin infusion; max 20 units of insulin lispro (HumaLOG)
No carbohydrates consumed	None

For All Patients

- If the glucose is not at target after 8 hours, notify the provider to investigate causes of persistent hyperglycemia.
- If target glucose has been maintained for ≥ 24 hours and insulin drip rate has not changed, contact provider to determine if it is appropriate to discontinue the intravenous insulin infusion and initiate a subcutaneous insulin regimen, including basal SC insulin.

For Patients on Intermittent Hemodialysis

- Do NOT increase insulin drip rate during dialysis session.
- May continue to decrease insulin infusion as indicated by protocol.
- Resume protocol following hemodialysis session.