PICU Pain & Sedation Pathway

Patient appears uncomfortable. Is the patient in pain?

Yes

Morphine 0.05 - 0.1 mg/kg/**dose** (usual starting max: 5 mg/**dose**) IV every 10 minutes until desired pain score achieved.
Max 3 doses.

No

Patient scores more positive than desired MMAAS. Reversible causes of agitation have been excluded. Environmental comfort measures provided but increased state of behavior is causing acute deterioration in patient's condition necessitating immediate control.

Midazolam 0.05 - 0.1 mg/kg/**dose** (usual max starting dose: 4 mg/**dose**) IV every 10 minutes until desired MMAAS score achieved. Max 3 doses.

Anticipated length of intubation?

Less than or equal to 48 hours?

INTERMITTENT DOSES

For sedation/agitation

Consider reversible causes of agitation and non-pharmacologic means to decrease agitation.

Midazolam 0.05 - 0.1 mg/kg/**dose** (usual starting max: 4 mg/**dose**) IV every 2 hours PRN agitation. Can consider dexmedetomidine continuous infusion.

For pain

Consider reversible causes of pain and non-pharmacologic means to decrease pain.

Morphine 0.05 - 0.1 mg/kg/**dose** (usual starting max: 5 mg/**dose**) IV every 2 hours PRN pain.

Greater than 48 hours?

CONTINUOUS INFUSIONS

Morphine infusion 0.05 mg/kg/hr (usual starting max: 4 mg/hr)
AND
Midazolam infusion 0.05 mg/kg/hr (usual starting max: 2 mg/hr)[#]
AND
Docusate 2.5 mg/kg/**dose** (adult dose: 250 mg/**dose**) PO/Tube BID

Bolus and/or pre-care doses are the same 1 hour dosing of morphine and midazolam drips

[#]If patient is less than 6 months start dexmedetomidine infusion instead of midazolam infusion; unless dexmedetomidine contraindications exist

last update: 082415 by Pharmacy

Identify patient's sedation phase every day on AM and PM rounds

Continuous infusions and PRN boluses that nurses can titrate and modify the orders per protocol include: morphine, fentaNYL, HYDROmorphone, and midazolam

Acute Phase
(goal MMAAS: -1 or -2; goal pain score#: < 4)

Goal: maintain status quo

MMAAS more positive than prescribed: exclude reversible causes of agitation and provide non-pharmacologic/comfort measures. If ineffective, rebolus with midazolam (agitation). Initially, boluses can be given every 10 minutes to achieve adequate MMAAS then will be changed to q1hr.

Pain score more positive than prescribed: exclude reversible causes of pain and provide non-pharmacologic/comfort measures. If ineffective, consider addition of pharmacologic adjunct therapies (e.g. acetaminophen, NSAIDs [ibuprofen, ketorolac]). If ineffective, rebolus with opioid (pain). Initially, boluses can be given every 10 minutes to achieve adequate pain score then will be changed to q1hr.

If ≥ 3 non-pre care bolus doses in ≤ 8 hours: **increase** opioid infusion by 10 – 20 % (pain) to maintain pain score goal OR increase midazolam infusion by 10 – 20% (agitation) to maintain MMAAS score. Infusion dose increase(s) should be immediately preceded by a bolus dose.

Once morphine is ≥ 0.3 mg/kg/hr: consider other options for pain management (see uncontrolled pain box to right)

Once midazolam is ≥ 0.3 mg/kg/hr: start dexmedetomidine infusion at 0.5 **mcg**/kg/hr starting with a 1 **mcg**/kg/**dose** loading dose over 10 minutes and then every 1 hour PRN (bolus dose should always be 0.5-1 mcg/kg and does not necessarily match hourly rate.). Once patient stable on dexmedetomidine, attempt to wean midazolam continuous infusion. If unable to wean midazolam and patient on > 2.5 **mcg**/kg/hr of dexmedetomidine, consider uncontrolled agitation. (see uncontrolled agitation box to right)

If ≥ 3 non-pre care bolus doses in ≤ 8 hours: **increase** opioid infusion by 10 – 20% (pain) to maintain pain score goal OR increase midazolam infusion by 10 – 20% (agitation) to maintain MMAAS score OR contact LIP/MD for **increases** in dexmedetomidine infusion (max dose: 2.5 **mcg**/kg/hr) (agitation)

Uncontrolled Pain:
-Consider opioid rotation (e.g. morphine → HYDROmorphone) see page 13 for calculations.
-In certain patients, consider neuropathic pain and treat appropriately (e.g. gabapentin)

Uncontrolled Agitation:
-Assess if patient may have opioid induced pruritus (which can exacerbate agitation). If present, treat appropriately with IV naloxone drip (see formulary for dosing).
-Consider assessing bladder for urinary retention (which can exacerbate agitation).
-Use non-pharmacologic adjunct therapies to decrease agitation (e.g. regular sleep/wake cycle, videos, music therapy, bubble tubes, fiber-optic lighting, child-life consult)
-Consider pharmacologic adjunct therapies to decrease agitation (e.g. diphenhydrAMINE)
-Consider ICU delirium
-If patient is hypoxic, optimize O_2 prior to using sedation medications for agitation.
-Note that if immobilization is the goal, will not achieve this with opioid/midazolam continuous infusion(s). Consider neuromuscular blocking agents when indicated.

More + than prescribed?

More - than prescribed?

Every 2 hours: assess MMAAS and pain scores.

If < 3 non-pre care bolus doses in 8 hours: **decrease** opioid (pain) or midazolam (agitation) infusion by weaning decrements on page 3

Titration Phase
(goal MMAAS: 0 or -1; goal pain score#: < 4)

Goal: Titrate to minimally effective dose and acceptable level of sedation. Alternate opioid and benzodiazepine wean following wean decrements on page 3. Note: For patients on both opioid and midazolam infusion, each agent should be weaned every 8 hours in an alternating fashion so that an agent weans every 4 hours. PRN midazolam and opioid should be changed to q2hr. Also, dexmedetomidine does NOT wean in this phase.

Every 2 hours: assess MMAAS and pain scores.

More + than prescribed?

MMAAS more positive than prescribed: exclude reversible causes of agitation and provide non-pharmacologic/comfort measures. If ineffective, consider addition of dexmedetomidine (if patient not already receiving) to aid in midazolam weaning or rebolus with midazolam (agitation).

Pain score more positive than prescribed: exclude reversible causes of pain and provide non-pharmacologic/comfort measures. If ineffective, rebolus with opioid (pain).

If ≥ 3 non-pre care bolus doses in ≤ 8 hours: **increase** opioid (pain) infusion by 10% to maintain pain score goal or midazolam (agitation) by 10% to maintain MMAAS score . Infusion dose increase(s) should be preceded by a bolus dose.

More - than prescribed?

If < 3 non-pre care bolus doses in 8 hours: **decrease** opioid (pain) or midazolam (agitation) infusion by weaning decrements on page 3 of protocol

Wake up test (if MMAAS -2/-3): turn off opioid and midazolam continuous infusions and keep off until MMAAS of 0 to -1. After assessment, re-initiate drips at 50% of dose.

Wean to Extubate Phase
(goal MMAAS: 0 or +1; goal pain score#: < 4): Test for extubation readiness if: spontaneous breathing, OI < 6 (MAP/PF ratio x 100), 10% decrease and/or plateau in ventilator support over the previous 12 hours

Goal: slowly wean to prevent withdrawal. Follow wean decrements on page 3 starting with opioid and once off then starting benzodiazepine wean.

If patient on opioids/ benzodiazepines for ≤ 5 days: discontinue drips prior to extubation. Monitor for withdrawal.

If patient on opioids/ benzodiazepines for > 5 days:
Wean opioid continuous infusion following weaning decrements on page 3 until off and then wean midazolam following weaning decrements on page 3 until achieve desired level of wakefulness for extubation. If desired, once at acceptable doses of continuous infusion(s) consider transitioning continuous infusion(s) to intermittent opioid (methadone) and/or benzodiazepine (LORazepam). If chosen, then continuous infusions should be discontinued (see pages 5-11).

If patient on dexmedetomidine drip: LIP/MD consider weaning slowly by 0.1 **mcg**/kg/hr every 8 hours once opioid and benzodiazepine continuous infusion wean is completed. If patient is on high dose dexmedetomidine (≥ 2 **mcg**/kg/hr) consider initiating wean earlier (alternating dexmedetomidine and midazolam weans) and/or a more frequent wean (e.g. q6hr).

If patient exhibits significant signs of withdrawal (WAT-1 > 3) on ≥ 3 separate assessments then:
-Consider possible conflicting diagnosis of ICU delirium
-Consider non-pharmacologic reasons for withdrawal symptoms.
-Give IV bolus doses of morphine (opioid) or midazolam (benzodiazepine) at 0.05 mg/kg (max starting dose: 2 mg). If ≥ 3 boluses within 24 hours with symptomatic improvement: Start/increase dose of methadone (opioid) AND/OR start/increase dose of LORazepam (benzodiazepine). Note that PRN IV midazolam and/or morphine may be needed for 24 hours after initiation/dose increase of methadone/LORazepam (until steady state is reached).
Note: if patient on methadone ≥ 0.25 mg/kg/dose and/or on other QTc prolonging medication(s) consider obtaining an EKG to assess QTc interval after 48 hours on methadone.
-If patient is exhibiting significant withdrawal despite methadone/LORazepam, consider addition of cloNIDine 5 -10 **mcg**/kg/day divided every 8 hours (oral) or a transdermal patch. If using transdermal patch, enteral cloNIDine bridge is needed (exception: if patient on dexmedetomidine continuous then enteral bridge is NOT needed)

= CNHS approved numeric pain score appropriate for the patient's clinical condition (INRS or FLAAC)

* Please note that if patient is on sedation pathway peri-extubation propofol should **not** be needed.

Weaning Decrements in Titration and Wean to Extubate Phases

Medication	Titration Decrements	Titration Interval
Morphine	0.02 mg/kg/hr	Every 8 hours (In titration phase, alternate between opioid and midazolam so that one agent is titrated every 4 hours)
FentaNYL	0.2 **mcg**/kg/hr	
HYDROmorphone	0.008 mg/kg/hr	
Midazolam	0.02 mg/kg/hr	
Dexmedetomidine*	0.1 **mcg**/kg/hr	

*Dexmedetomidine wean should only be initiated in the "wean to extubate" phase. Wean listed is only a suggestion, quicker weans can be initiated by the MD/LIP if desired.

Note: While weaning in both the "Titration" and "Wean to Extubate" phases closely monitor WAT-1 scores. If signs of withdrawal are present, stop scheduled wean, increase to last tolerated dose, and then once patient is stable resume with a lower titration decrements. Consult the PICU unit based pharmacist as needed.

CONVERTING IV CONTINUOUS INFUSION OPIOID TO INTERMITTENT ENTERAL METHADONE

Opioid Conversion: Methadone Dose Calculation

Opioid	IV Dosing Conversion Threshold
Morphine	0.15 mg/kg/hr
FentaNYL	1.5 **mcg**/kg/hr
HYDROmorphone	0.02 mg/kg/hr

- From **morphine** continuous infusion to <u>enteral</u> methadone:
  - –Morphine ___ mg/kg/hr x ___ kg x 3 = ___ mg enteral methadone/**dose***
    - Max initial methadone dose = 0.3 mg/kg/**dose** (max initial dose: 5 mg/**dose**)
    - Calculated dose should be given every 6 hours for 48 hours and then transitioned to every 8 hours

- From **fentaNYL** continuous infusion to <u>enteral</u> methadone:
  - –FentaNYL ___ **mcg**/kg/hr x___ kg x 0.3 = ___mg enteral methadone/**dose***
    - Max initial methadone dose = 0.3 mg/kg/**dose** (max initial dose: 5 mg/**dose**)
    - Calculated dose should be given every 6 hours for 48 hours and then transitioned to every 8 hours

- From **HYDROmorphone** continuous infusion to <u>enteral</u> methadone:
  - –HYDROmorphone ___ mg/kg/hr x ___ kg x 20 = ___ mg enteral methadone/**dose***
    - Max initial methadone dose = 0.3 mg/kg/**dose** (max initial dose: 5 mg/**dose**)
    - Calculated dose should be given every 6 hours for 48 hours and then transitioned to every 8 hours

* = If IV methadone is needed then IV dose (mg) should be ½ of calculated enteral dose (mg)

Opioid Conversion Plan

IV continuous infusion opioid to intermittent enteral methadone:
Start calculated enteral methadone dosing (from page 5)
Wean opioid infusion by 50% 30 minutes after the 3rd enteral dose of methadone
Turn opioid infusion off 30 minutes after the 4th enteral dose of methadone

- Weaning intermittent enteral methadone:
  - Methadone dose calculated (from page 5) should be given q6hr x 48 hours, then spaced to q8hr
  - Once stable on q8hr methadone for 24 hours with no withdrawal symptoms and off opioid continuous infusion, wean methadone as follows:
    - Wean methadone <u>every other day</u> by decreasing the dose by 10 – 20 % (of original dose) until at a dose of ≤ 0.05 mg/kg/**dose**, then change dosing interval to q12hr, and then q24hr and then discontinue
    - Do not wean methadone and LORazepam on the same day (instead wean methadone on day 1 and LORazepam on day 2)

Methadone Intolerances

Excessive Sedation:

- Decrease the methadone dose by 25% of current dose. Can consider holding next scheduled dose of methadone.
- Once stable on lower methadone dose for 24 hours with no signs of withdrawal, reinitiate a methadone wean

Signs of Withdrawal (as indicated by a WAT-1 score > 3):

- Consider administration of PRN rescue medication
  - PRN agent of choice: morphine 0.05 mg/kg/**dose** (max initial dose: 2 mg/**dose**) IV every 2 hours PRN withdrawal
  - If patient requires > 3 PRN rescue doses in a 24 hour period, work with pharmacy to increase methadone dose and/or devise a new weaning plan with a more gradual tapering
- If patient continued to experience signs of agitation consider possible ICU delirium

CONVERTING IV CONTINUOUS INFUSION MIDAZOLAM TO INTERMITTENT ENTERAL LORAZEPAM

Benzodiazepine Conversion: LORazepam Dose Calculation

Benzodiazepine	IV Dosing Conversion Threshold
Midazolam	0.2 mg/kg/hr

- From **midazolam** continuous infusion to <u>enteral</u> LORazepam:
  - –Midazolam ___ mg/kg/hr x ___ kg x 1.2 = ___ mg LORazepam/**dose***
  - Max initial LORazepam dose = 0.2 mg/kg/**dose** (Max initial dose: 4 mg/**dose**)
  - Calculated dose should be given every 6 hours

* = If IV LORazepam is needed then IV dose (mg) is equal to calculated enteral dose (mg)

Benzodiazepine Conversion Plan

IV continuous infusion to intermittent enteral LORazepam:
Start calculated enteral LORazepam dosing (from page 9)
Wean benzodiazepine infusion by 50% 30 minutes after the 3rd enteral dose of LORazepam
Turn benzodiazepine infusion off 30 minutes after the 4th enteral dose of LORazepam

- Weaning LORazepam:
  - Once stable on LORazepam for 24 hours with no withdrawal symptoms, and off benzodiazepine continuous infusion, wean LORazepam as follows:
    - Wean LORazepam every other day by first changing the dosing interval to every 8 hours, then by decreasing the dose by 10 – 20 % (of original dose) until at a dose of ≤ 0.05 mg/kg/**dose**, then change dosing interval to every 12 hours, and then every 24 hours and then discontinue
    - Do not wean methadone and LORazepam on the same day (instead wean methadone on day 1 and LORazepam on day 2)

LORazepam Intolerances

Excessive Sedation:

- Decrease the LORazepam dose by 25% of current dose. Can consider holding next scheduled dose of LORazepam.
- Once stable on lower LORazepam dose for 24 hours with no signs of withdrawal, reinitiate a LORazepam wean

Signs of Withdrawal (as indicated by a WAT-1 score > 3):

- Consider administration of PRN rescue medication
  - PRN agent of choice: midazolam 0.05 mg/kg/**dose** (max initial dose: 2 mg/**dose**) IV every 2 hours PRN withdrawal
  - If patient requires > 3 PRN rescue doses in a 24 hour period, work with pharmacy to increase LORazepam dose and/or devise a new weaning plan with a more gradual tapering
- If patient continued to experience signs of agitation consider possible ICU delirium

CALCULATIONS FOR CLASS SWITCHING OPIOID CONTINUOUS INFUSIONS

Opioid Agonist	Approximated Equianalgesic Dose (IV to IV)
Morphine	10 mg
HYDROmorphone	1.5 mg
FentaNYL	100 **mcg**

- **Morphine** continuous infusion **to HYDROmorphone** continuous infusion
  - ____mg/kg/hr (morphine) x 0.15 = ____ mg/kg/hr (HYDROmorphone)
- **Morphine** continuous infusion **to fentaNYL** continuous infusion
  - ____mg/kg/hr (morphine) x 10 = ____ **mcg**/kg/hr (fentaNYL)
- **HYDROmorphone** continuous infusion **to morphine** continuous infusion
  - ____mg/kg/hr (HYDROmorphone) x 6.7 = ____ mg/kg/hr (morphine)
- **HYDROmorphone** continuous infusion **to fentaNYL** continuous infusion
  - ____mg/kg/hr (HYDROmorphone) x 66.7 = ____ **mcg**/kg/hr (fentaNYL)
- **FentaNYL** continuous infusion **to morphine** continuous infusion
  - ____**mcg**/kg/hr (fentaNYL) x 0.1 = ____ mg/kg/hr (morphine)
- **FentaNYL** continuous infusion **to HYDROmorphone** continuous infusion
  - ____**mcg**/kg/hr (fentaNYL) x 0.015 = ____ mg/kg/hr (HYDROmorphone)

ASSESSMENT TOOLS

Modified Motor Activity Assessment Scale (MMAAS)

Chemically Paralyzed OR developmentally dysmature patients (Score and Description)	Intubated Patients supported on Mechanical Ventilation		
	Score	**Description**	**Definition**
- Unresponsive No autonomic response (change in heart rate or blood pressure) to a noxious stimulus	-3	Unresponsive	No spontaneous respiratory effort. Minimal or no response to noxious stimulus Does not communicate or follow commands
	-2	Responsive only to noxious stimuli	Spontaneous but ineffective respiratory effort. Opens eyes or raises eyebrows or turns head toward stimulus or moves limbs with noxious stimulus. Some spontaneous movement. Dues not communicate.
0 Responsive < 20% increase in heart rate/blood pressure to a noxious stimulus	-1	Responsive to gentle touch or name	Opens eyes or raises eyebrows or turns head toward stimulus or moves limbs with gentle touch or when name is spoken. Follows simple commands. Drifts off after stimulation.
	0	Calm and cooperative	Spontaneous and effective tidal volume. No external stimulus is required to elicit movement. Calm, awakens easily, and follows commands.
	+1	Restless but cooperative	No external stimulus is required to elicit movement. Increase limb movement. Picking at tubes but consolable.
+ Hyper-responsive ≥ 20 % increase in heart rate/blood pressure to a noxious stimulus	+2	Agitated	Having Difficulty synchronizing with ventilator. No external stimulus is required to elicit movement. Attempting to sit or moves limbs to get up. Difficult to console despite frequent attempts. Required physical restraint.
	+3	Excessively agitated	Unsynchronized with mechanical ventilation – desaturating. No external stimulus is required to elicit movement . Patient unsafe – attempting to pull at ETT/catheters. Biting ETT. Thrashing side-to-side; climbing over the rail; striking at staff.

FLACC Pain Score

Categories	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown; withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake of asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs; frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to; distractible	Difficult to console or comfort

Interpreting the Behavioral Score

Each category is scored on the 0 – 2 scale, which results in a total score of 0 to 10

0 = Relaxed and comfortable
1 – 3 = Mild discomfort
4 – 6 = Moderate pain
7 – 10 = Severe discomfort or pain or both

Withdrawal Assessment Tool Version 1 (WAT-1)

Information from patient record, previous 12 hours	
Any loose/watery stools	No = 0 Yes = 1
Any vomiting/wretching/gagging	No = 0 Yes = 1
Temperature > 37.8˚C	No = 0 Yes = 1
2 minute pre-stimulus observation	
State	MMAAS ≥ 2 = 1 MMAAS < 2 = 0
Tremor	Normal/mild = 0 Moderate/severe = 1
Any sweating	No = 0 Yes = 1
Uncoordinated/repetitive movement	Normal/mild = 0 Moderate/severe = 1
Yawning or sneezing	None or 1 = 0 ≥ 2 = 1
1 minute stimulus observation	
Startle to touch	None/mild = 0 Moderate/severe = 1
Muscle tone	Normal = 0 Increased = 1
Post-stimulus Recovery	
Time to gain calm state (MMAAS ≤ 1)	< 2 minute = 0 2 – 5 min = 1 > 5 min = 2

Note: Nurse should perform WAT-1 scoring daily once patient has had ≥ 5 days of exposure to opioids and/or benzodiazepines. Additionally, when weaning doses of opioids or benzodiazepines WAT-1 scoring should be performed every 8 hours.

DRUG GLOSSARY

Analgesia/Sedation Drugs

Generic Drug Name	Therapeutic Indication(s)	Pediatric Dose Range	Adult Dose Range	Adverse Reaction(s) and/or Special Information
Morphine	Pain	Intermittent (IV): 0.05 to 0.1 mg/kg/dose every 2 to 4 hours PRN pain Continuous infusion (IV): 0.05 to 0.5 mg/kg/hr	Intermittent (IV): 2.5 to 5 mg/dose every 2 to 4 hours PRN pain Continuous infusion (IV)#: 2 to 10 mg/hr	Pruritus, hypotension, constipation, nausea, vomiting, dizziness, somnolence, urinary retention
FentaNYL	Pain	Intermittent (IV): 1 to 2 **mcg**/kg/dose every 1 to 2 hours PRN pain Continuous infusion (IV): 1 to 5 **mcg**/kg/hr	Intermittent (IV): 25 to 100 **mcg**/dose every 1 to 2 hours PRN pain Continuous infusion (IV)#: 25 to 200 **mcg**/hr	Constipation, nausea, vomiting, dizziness, somnolence, urinary retention
HYDROmorphone	Pain	Intermittent (IV): 0.01 mg/kg/dose every 3 to 6 hours PRN pain Continuous infusion (IV): 0.003 to 0.1 mg/kg/hr	Intermittent (IV): 0.2 to 0.6 mg every 2 to 3 hours PRN pain Continuous infusion (IV)#: 0.5 to 1 mg/hr	Pruritus, constipation, nausea, vomiting, dizziness, somnolence
Midazolam	Agitation/sedation	Intermittent (IV): 0.025 to 0.1 mg/kg/dose PRN sedation/anxiety Continuous infusion (IV): 0.05 to 0.4 mg/kg/hr	Intermittent (IV): 1 to 5 mg/dose every 2 to 4 hours PRN sedation/anxiety Continuous infusion (IV)#: 0.04 to 0.2 mg/kg/hr or 2 to 10 mg/hr	Somnolence, headache
Dexmedetomidine	Agitation/sedation	Loading dose: 1 **mcg**/kg/dose Intermittent (IV): 0.5 to 1 **mcg**/kg/dose PRN sedation/anxiety Continuous infusion (IV): 0.2 to 3 **mcg**/kg/hr	Loading dose (IV): 0.5 to 1 **mcg**/kg Continuous infusion (IV): 0.2 to 0.7 **mcg**/kg/hour	Hypertension, tachycardia, nausea, hypotension, arrhythmia
Methadone	Pain/opioid withdrawal	Intermittent (PO): 0.05 to 0.3 mg/kg/dose every 6 to 12 hours	Intermittent (PO): 5 to 10 mg/dose every 4 to 12 hours	QTc prolongation (dose dependent), constipation, hypotension, nausea, vomiting, sedation, dizziness
LORazepam	Agitation/ benzodiazepine withdrawal	Intermittent (PO): 0.05 to 0.3 mg/kg/dose every 4 to 8 hours	Intermittent (PO): 2 to 4 mg/dose every 4 to 8 hours	Dizziness, sedation
CloNIDine	Augmentation of opioid/benzodiazepine withdrawal, dexmedetomidine withdrawal	Intermittent (PO): 5 to 25 **mcg**/kg/**day** divided to be given every 6 to 12 hours Transdermal: 5 to 25 **mcg**/kg/**day** (dose rounded to the nearest ½ patch)	Intermittent (PO): 0.1 to 0.8 mg/**day** in 2 divided doses Transdermal: 0.1 to 0.6 mg/**day** (dose rounded to the nearest ½ patch)	Contact dermatitis (patch), dizziness, headache, sedation, somnolence Bridging with oral for transdermal: Day 1: Place patch; administer 100% of oral dose. Day 2: Administer 50% of oral dose. Day 3: Administer 25% of oral dose. Day 4: Patch remains; no further oral supplement necessary

Please note that all continuous infusion orders (even for adult and adult sized patients) should be ordered in Cerner and dosed in units/kg/time" (e.g. mg/kg/hr, or **mcg**/kg/hr)

Dexmedetomidine

- Potential indications in the PICU patient:
  - Agitation/sedation not being adequately managed on high dose midazolam (≥ 0.3 mg/kg/hr)
  - Agitation/sedation in a patient with a planned short term intubation (< 48 hours)
  - To assist with weaning of opioid and/or midazolam continuous infusion(s) in the "titration" or "wean to extubate" phase
- Dosing pearls:
  - Always administer a loading dose of 1 **mcg**/kg over 10 minutes prior to initiating the continuous infusion
  - Bolus dosing is always 0.5 to 1 **mcg**/kg IV every 1 hours PRN sedation/agitation
    - Note that bolus dosing is NOT necessarily equal to the hourly rate
  - Continuous infusion dosing commonly reported in the literature is 0.2 to 2.5 **mcg**/kg/hr
- Titrating off dexmedetomidine:
  - Suggested weaning: 0.1 **mcg**/kg/hr weaning every 8 hours (can wean faster per MD/LIP)
  - Weaning is recommended due to potential for withdrawal
    - There are case reports to support dexmedetomidine acute discontinuation syndrome when dexmedetomidine is stopped abruptly
- Monitoring: heart rate, blood pressure, MMAAS scores, WAT-1 score (if using to assist with weaning of opioid/midazolam)
- Adverse effects:
  - Common: hypertension, tachycardia, nausea
  - Serious (rare): bradyarrthmia, hypotension, sinus arrest, respiratory depression, apnea
- Converting to cloNIDine:
  - Not always indicated (can wean down dexmedetomidine drip)
  - If wish to switch to cloNIDine:
    - Typical starting dose of cloNIDine: 5 to 10 **mcg**/kg/**day**
      - divided every 8 hours (oral) or a transdermal patch (round to nearest ½ patch)
    - If using transdermal patch, enteral cloNIDine bridge is needed (exception: if patient on dexmedetomidine continuous infusion then enteral bridge is NOT needed)
      - Enteral bridge:
        - » Day 1: Place patch; administer 100% of oral dose.
        - » Day 2: Administer 50% of oral dose.
        - » Day 3: Administer 25% of oral dose.
        - » Day 4: Patch remains; no further oral supplement necessary